Brushless ServoDrive

SISP DRIVE

User's Manual
Installation
and advanced use

Thank you for choosing this product SIRCO

We shall be glad to receive at the e-mail address: info@sirco.it any information that may be useful to help us to improve this manual.
Before using the product, carefully read the chapter concerning the safety instructions.
During the period of its operation, please store the manual in a safe place, available for technicians.
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1. Chapter - Safety instructions

LEGEND: SAFETY SYMBOLS

It indicates a procedure or a condition of operation that, if not observed, may cause death or damages to persons.

It indicates a procedure or a condition of operation that, if not observed, may cause the damage or the destruction of the equipment.

It indicates a procedure or a condition of operation whose observance may optimize the application.

REMARK ! It draws the attention for special procedures and conditions of operation.

Here below we indicate the instructions related to safety.
The lack of observance of these instructions may cause serious injuries, death, damages to the Drive and to the equipment that interacts with the Drive.

Grounding

The Drive and the motors must be electrically ground connected according to the electric standards in force.
It is not allowed the operation of the Drive without the ground connection.
To avoid electromagnetic interferences, the frame of the motor must be grounded through a ground cable separated from the ground cables of the other equipment.
The Drives and incoming filters have a dispersion current to the ground greater than 3,5 mA. The standard EN50178 specifies that in presence of dispersion currents greater than 3,5 mA the ground cable connection must be of a fixed type and doubled for the redundancy.

Danger of electric shock

Some internal parts of the Drive are under voltage during the operation.

Re-position all covers before power supplying the device. The lack of observance of this warning can be a cause of death or serious damages to people.
Do not open the device or the covers when it is power supplied. The minimum waiting time before operating on the terminals inside the device is indicated in the paragraph 5.7 “Voltage Level of the Drive for safety operations” of this Manual.
Do not operate on the connections of the motor if the Drive is power supplied.

Mechanical danger

The equipment that hosts the Drive causes mechanical movements. Who manages the system is responsible to ensure that these mechanical movements do not create conditions of danger. The safety blocks and operating limits forecast by the manufacturer must not be bypassed or modified.
In case of malfunction, the Drive, even though it is disabled, may cause some accidental movements if it has not been disconnected from the power supply mains.
Besides the protection logics controlled by the software, the Drive does not have any other protection against overspeed.
It is necessary to always respect the maximum number of revolutions declared by the manufacturer of the motor, independently from the maximum frequency that can be issued by the Drive.

Danger of Fire and of Explosion

The installation of the Drive in risky areas, where there are flammable substances, combustible vapors or dusts, may cause fires or explosions. The Drives must be installed far from these areas. In these applications the motors must be of the "Antideflagration" type.
In case of fire near the equipment do not use extinguishing devices containing water.
Avoid in any case the penetration of water or other fluids inside the equipment.

Compliance to the directive EEC

For the systems destined to the countries of the European continent the Drive and the accessories must be used only after verifying that the whole system has been designed using the safety devices required by the standard 89/392/CEE relatively to the sector of automation.

Measuring devices

When using measuring devices e.g. oscilloscopes, that are connected to the power supplied equipment, the frame of the instrument must be grounded and a differential probe must be used. To obtain actual readings, choose with care the probes and terminals and pay attention to the adjustment of the oscilloscope. For the adjustment of the instrument and a correct use, please refer to the instruction manual of the instrument's manufacturer.
Do not perform tests of dielectric strength on parts of the Drive. For the measurement of the voltages of the signals, use suitable measuring devices (minimal internal resistance 10 kohm/V).

Final observations

Make sure that it is always ensured a sufficient ventilation in order to evacuate the losses of the Drive.

Do not power supply voltages exceeding the voltage admitted. If excessive voltages are applied, its internal components shall be damaged.

The Drive must be fixed on a wall built with materials resisting to heat. During the operation the temperature of the ventilation wings of the Drive may reach 90°C.

No capacitive load (ex. power factor correction) can be connected to the output of the Drive (terminals U, V, W).

The motor must be protected against overload.

If the Drive has not the suitable filters, and is connected to public mains of distribution with low voltage, it may cause interferences to radio frequencies.

Destination of use and setup

No modification or operation not forecast by the manual is allowed without the explicit authorization of the manufacturer and must be eventually performed only by qualified personnel. In case of lack of observance the manufacturer shall not be liable for possible consequences and the warranty shall expire.

The Drives by variable frequency are electric equipment forecast for industrial use.
We shall not be liable for any use of the Drive different from those described in this manual.

The setup and startup is allowed only to qualified personnel, who is responsible of the respect of the safety standards in force.

REMARK!

The storage of the Drive for more than two years may damage the capacity of operation of the capacitors of the DC link that will have to be then “restored”: before the startup we suggest to power supply the Drive for at least two hours without the load and without enabling the output.

1.1. Type of power supply and ground connections

Mains TN or TT

The SISP Drives of Sirco are designed in order to be power supplied with standard three-phase mains, electrically symmetric with respect to the Ground.
For the single phase Drives a one-phase connection is required, neutral and Ground, for the Three-phase one the connection to the three phases and Ground.

IT Mains

In case of power supply through IT mains it is strictly necessary the use of a star/delta transformer, with secondary tern referred to the ground.

Attenzione!

In case of mains of IT power supply an eventual loss of insulation of one of the devices connected to the same mains can be a cause of malfunctions of the Drive if you do not use the star/delta transformer.

2. Chapter General Features

The SISP Drive series is the realization of a new concept in the technology of the motion control, a very fast servoDrive based on the DSP (digital signal processor) dedicated to the control of servosystems in real time and integrated in a versatile and innovative hardware of power.

SISP Drive is a servoDrive by IGBT specially suitable for applications with brushless servomotors with high passband.

SISP Drive is characterized by a full-digital regulation with a cycle of 16kHz, passband of the current loop of 5kHz, position loop with zero tracking error, analog interface, dedicated digital interfaces and I/O expansion.

The voltages of power supply of the various cards are obtained through switching feeder, starting from the voltage of the intermediate circuit.
The Drive bridge is realized with devices IGBT (Insulated Gate Bipolar Transistor). The output is protected against short circuits of phase and towards the ground.

The Drive is characterized by:

- Couple control.
- Speed control.

- 1 input resolver
- 1 input encoder, input in frequency, probes with hall effect (encoder), output for encoder repetition
- 4 configurable digital inputs
- 2 configurable digital outputs (open collector)
- 1 digital relay output 125Vac –0,3A/1A–30Vcd.
- 3 status LED or (DCLink, Run enable, Fault)
- 2 differential analog inputs (11 bit + sign).
- A configurable analog output (11 bit + sign).

REMARK!

The terminal board of the electronic circuits of control and adjustment are galvanically separated from those of power.

Options

→ Key E^2PROM for the storage of the parameterization of a specific application

→ Kit of keyboard remote control

→ Filter EMC Class A or Class B

→ Resistance of external braking.

3. Chapter Description of Components and Specifications

3.1. Storage, Transport

3.1.1 General

The SISP Drives are packed with care for a correct shipment. The transport must be performed with suitable devices (according to the weight). Pay attention to the instructions printed on the package. This is valid also for the unpacked equipment to be introduced in control cubicles.

Verify immediately upon the supply that:

The package has not undergone visible damages, the data of the delivery note correspond to the order made.

Perform with care the opening operations of the packages and make sure that:

during the operations of transport no part of the equipment has been damaged, the equipment corresponds to the type actually ordered.

In case of damage or of incomplete or wrong supply, directly inform the competent commercial office.

The storage must be made only in dry places and within the limits of temperature specified.

REMARK!

The variations of temperature may cause the formation of condensate into the equipment. This is acceptable under certain conditions (see paragraph “Environmental conditions and Standards”), but it is not acceptable during the operation of the equipment. Make sure in any case that the equipment to which it is applied power supply does not show traces of humidity!

3.1.2 Designation of the Type of Drive

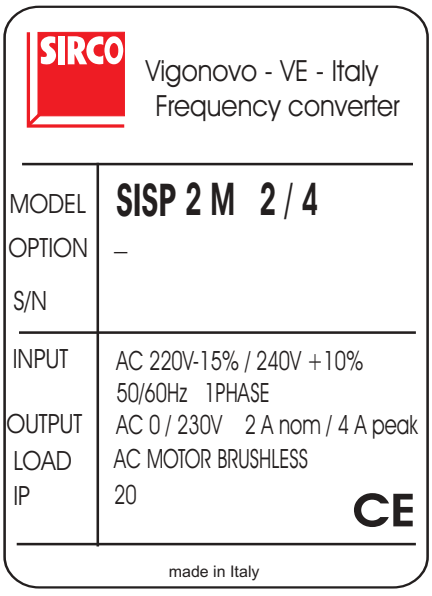
The fundamental technical data of the Drive are documented in the mark and on the identification plate. Example:

	Drive power supply	*Rated Output current (A rms)*	*Maximum output current (A rms)*
SISP	**2M**	**4**	**8**
	2M = 220Vac single phase **2T** = 220Vac three-phase	**2** = 2 A rms **4**= 4 A rms **5,5** = 5,5 A rms 8 = 8 A rms	**4** = 4 A rms **8** = 8 A rms **11** = 11 A rms 16 = 16 A rms

The choice of the Drive is made according to the nominal current of the motor. The nominal output current must be greater or equal than the one required by the motor employed.

3.1.3 Plate

Verify that all data indicated in the plate fixed on the Drive correspond to the product ordered.



3.2. Components Identification

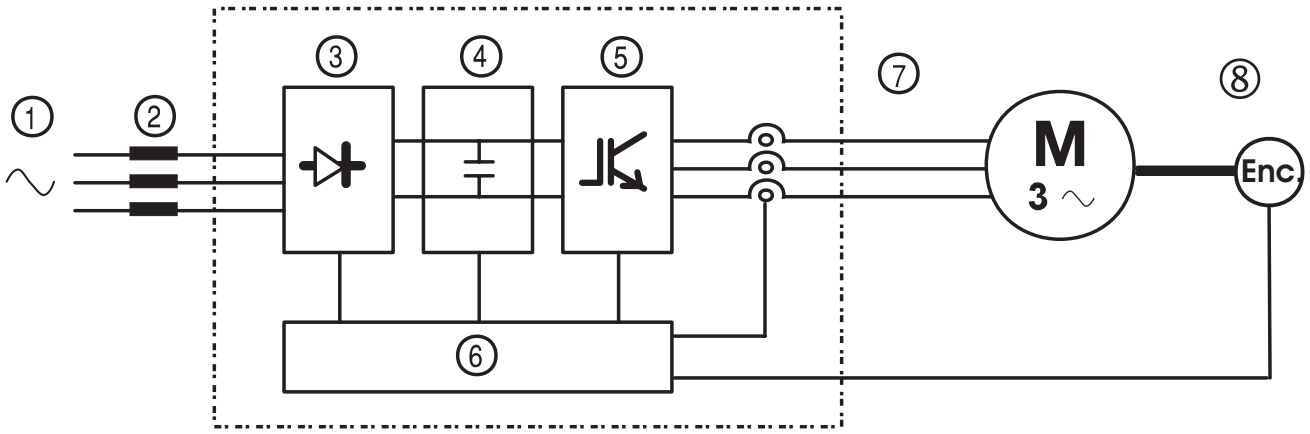


Figure 3.2.1: Fundamental diagram of a frequency Drive

A SISP Drive converts the constant voltage and frequency of a three-phase power supply into direct voltage and then it converts this direct voltage into a new three-phase power supply with variable voltage and frequency. This variable three-phase power supply can be used to adjust with continuity the speed of the brushless servomotors.

1 Voltage of mains power supply: 230V single phase and 230Vac +10% / -15%.

2 Inductance of mains. (see chapter “Inductors / Filters”)

3 Rectifier bridge.

Converts an alternated voltage into a direct voltage through a bridge by whole wave.

4 Intermediate circuit.

-With resistance of preload and capacitors of extension.

-Direct voltage (U_{DC}) =1,41 x voltage of mains (U_{LN})

-At this level it is introduced the braking unit to manage the resistance of external braking

5 Drive bridge at IGBT.

Converts the direct voltage into an alternated three-phase voltage with variable amplitude and frequency

6 Configurable part of control.

Cards for the control and the adjustment of the part of power by closed and open loop. The commands, references and reactions are connected to it.

7 Output voltage.

Variable alternated voltage from 0 to 94% of the power supply voltage (UL_N).

8 Speed feedback (ex.Encoder, Resolver, …)

3.3. General Specifications

3.3.1 Environmental Conditions and Standards

Table 3.3.1.1: Environmental specifications

A M B I E N T E		
T_A Room temperature	[°C]	0 … +40; +40…+50 with declassation
	[°F]	32 … +104; +104…+122 with declassation
Installation environment		Degree of pollution 2 or greater (free from direct sunrays, vibrations, dusts, corrosive or flammable gas, fog, vaporous oils and water drippings; avoid environments with a high salty degree)
Installation altitude		Up to 1000 m (3281 feet) above sea level; for greater altitudes, consider a declassation of current of 1.2% every 100 m (328 feet) of additional height applied.
Temperature:		
operation [1)]		0…40°C (32°…104°F)
operation [2)]		0…50°C (32°…122°F)
storage		-25…+55°C (-13…+131°F), class 1K4 for EN50178
		-20…+55°C (-4…+131°F), for devices with keyboard
transport		-25…+70°C (-13…+158°F), class 2K3 for EN50178
		-20…+60°C (-4…+140°F), for devices with keyboard
Air humidity:		
operation		from 5 % to 85 % and from 1 g/m^3 to 25 g/m^3 without humidity (or condensate) or frost (class 3K3 as for EN50178)
storage		from 5% to 95 % and from 1 g/m^3 to 29 g/m^3 (Class 1K3 as for EN50178)
transport		95 % [3)] 60 g/m [4)]
		A slight humidity (or condensate) may occasionally appear for a short time if the device is not operating (class 2K3 as for EN50178)
Air pressure:		
operation	[kPa]	from 86 to 106 (class 3K3 as for EN50178)
storage	[kPa]	from 86 to 106 (class 1K4 as for EN50178)
transport	[kPa]	from 70 to 106 (class 2K3 as for EN50178)
S T A N D A R D		
General conditions		EN 61800-1, IEC 143-1-1.
Safety		EN 50178, UL 508C
Climatic conditions		EN 60721-3-3, class 3K3. EN 60068-2-2, test Bd.
Distances and dispersions		EN 50178, UL508C, UL840. Category overvoltage for the connections of the input circuit: III; pollution degree 2
Vibrations		EN 60068-2-6, test Fc.
EMC compatibility		EN61800-3 see manual “Guide….EMC”)
Input mains voltage		IEC 60038
Protection degree		IP20 conform to standard EN 60529
		IP40 for cubicle with dissipator mounted externally
Certifications		CE

1) Ambient temperature = 0 ... 40°C (32°...104°F)

Besides 40°C (104°F) and up to 50°C: reduction of the 2% of the output current for K

2) Ambient temperature = 0 ... 50°C (32°...122°F):

Reduction of the output current by 20%.

3) Greater values of relative air humidity generated with
the temperature at 40°C (104°F) or if the temperature of the Drive
undergoes suddenly a variation from -25 ...+30°C (-13°...+86°F).

4) Greater values of air humidity if the Drive undergoes suddenly
a variation from 70...15°C (158°...59°F).

Equipment disposal

The Drive of the series SISP Drive can be disposed of as electronic scrapes according to the national regulations in force.
The front covers are recyclable: the material used is >ABS<.

3.3.2 Connection to the mains and output of the Drive

The SISP Drives must be connected to a mains capable to provide a symmetrical short circuit power lower or equal to the values indicated in the table 3.3.2.1. For the eventual introduction of an inductance of mains see the chapter “Inductors and Filters”.
Detect from table 3.3.2.1 the voltages of mains allowed. The cyclic sense of the phases is free. Voltages being lower than the minimum values of tolerance shall cause the block of the Drive.
You can obtain the automatic restart of the Drive after that an alarm condition has occurred.

REMARK!

In some cases on the input side some inductances of mains and eventual filters EMI are necessary. See the instructions contained in the chapter “Inductors and Filters”.

The Drives and filters of mains have dispersion currents towards ground greater than 3,5 mA. The standards EN 50178 foresee that, for dispersion currents greater than 3,5 mA, the ground connection must be of a fixed type (to the terminal PE) and doubled for redundancy.

Table 3.3.2.1: Technical data of Input/Output for the sizes in Kw/Hp

Drive SISP	IMPUT		OUTPUT		
	Imput Voltage ULN	Imput Current I_N	Rated output Current I_{2N}: '@ ULN=220 /400Vac; fSW=default; IEC 146 classe 2	Current Peak Ip	Switching Frequenzy fSW (Default)
	[V]	[A]	[A]	[A]	[kHz]
SISP 2M 2-4	220 V -15% ... 240 V +10%, 50/60 Hz, 1Ph	4,5	***2,0***	4,0	8,0
SISP 2M 4-8		8,0	***4,0***	8,0	
SISP 2M 6-12		11,0	***6,0***	12,0	
SISP 2M 8-16		18,0	***8,0***	16,0	
SISP 2T 2-4	220 V -15% ... 240 V +10%, 50/60 Hz, 3Ph	2,5	***2,0***	4,0	
SISP 2T 4-8		4,4	***4,0***	8,0	
SISP 2T 6-12		6,8	***6,0***	12,0	
SISP 4T 2-4	380 V -15% ... 460 V +10%, 50/60 Hz, 3Ph	2,9	***2,0***	4,0	
SISP 4T 4-8		5,0	***4,0***	8,0	
SISP 4T 6-12		8,0	***6,0***	12,0	

3.3.3 Current absorbed by the Drive

The current absorbed by the mains from the Drive depends upon the status of service of the motor connected.

3.3.4 Precautions for the Drive output

Attenzione!

The output of the SISP Drive is protected against short circuits of phase and towards ground.
It is not allowed to connect an external voltage to the output terminals of the Drive! When the Drive is power supplied, it is possible to disconnect the motor from the output of the Drive after that it has been disabled.
Peak current of the Drive is two times the nominal current for 30 seconds every 10 minutes
I max =2xnl (for 30 seconds every 10 minutes)

3.3.5 Part of Adjustment and Control

2 Analog inputs 1 Programmable Differential Analog Input:

- in voltage -10/+10 V 0.5 mA max, 10 bit (+ sign)
- in voltage 0-10 V 0.5 mA max, 10 bit [default]
- in current 0...20 mA, 10 V max, 10 bit
- in current 4...20 mA, 10 V max, 10 bit

1 Programmable Differential Analog Input :

- in voltage -10/+10 V 0.5 mA max, 10 bit (+ sign)
- in voltage 0-10 V 0.5 mA max, 10 bit [default]
- in current 0...20 mA, 10 V max, 10 bit
- in current 4...20 mA, 10 V max, 10 bit

4 Digital inputs 4 Programmable Digital Inputs: 24V / 6 mA

- Digital input 1 = Run (default)
- Digital input 2 = Cancels the speed reference
- Digital input 3 = External fault
- Digital input 4 = Reset alarms

3 Digital outputs 3 Programmable digital outputs:

Output open collector 1= Drive ready (default)

Output open collector 2= Steady Status (default)

Output relay type =Motor running [230Vac-0.2A / 30Vdc-1A]

Auxiliary voltages available on the terminal board of the Drive

Capacity: + 24Vdc, 150mA

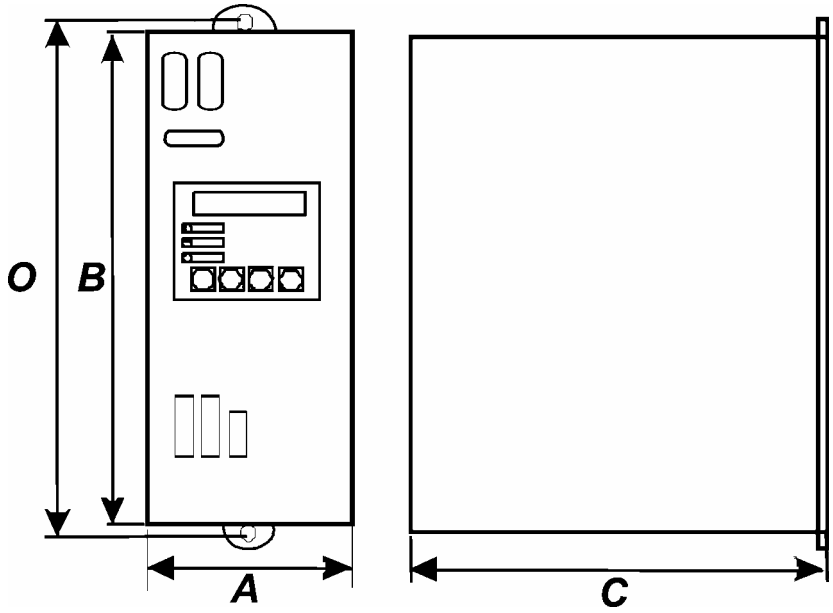
+ 10Vdc, 10mA

Tolerances: + 24Vdc ±5 %

+/- 10Vdc ±3 %

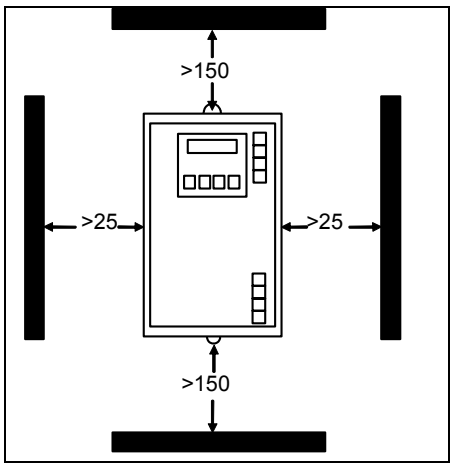
4. Chapter Assembly

4.1. Mechanical specifications and assembly distances



SISP	Overall dimensions			Fixing Holes	Minimum spaces for ventilation		
Measures in [mm]	A	B	C	O	Above and below	Side	Front
Size 1	69	191	153	200	150	25	50

Maximum admittable inclination compared to the vertical is 30°.



Minimum distances (mm) to observe considering also a possible maintenance intervention inside the converter itself

During the assembly please consider the measures indicated in this manual. Use the suitable necessary instruments and equipment. Unsuitable handlings and use of improper tools may cause damages.

Do not install near the Drive any other equipment generating heat.

After some days of operation verify the connections in the terminal board.

The internal ventilation is ensured by a fan, where forecast, managed by the microcontroller; the fan operates, for a minute, upon the startup and during the running up to a minute after the stop command. Furthermore, the control can enable the fan each time the monitoring of the internal temperature requires such enabling.

4.2. Motors and feedback devices

The SISP Drives are developed for the adjustment of the brushless servomotors. It is possible to use:

- an encoder
- a resolver

4.2.1 Motors

Data of the motor necessary for the connection to the Drive

Specifications of the identification plate

- Nominal voltage of the motor
- Nominal current of the motor
- Number of poles
- Nominal speed of the motor

- Type of thermal protection of the motor

Motor protection

Thermistors

The thermistors PTC mounted on the motor in compliance to the standard DIN 44081 or 44082 can be connected directly to the Drive through PIN 1 and 6 of the connector DB9 Resolver.

Contacts depending on the temperature in the winding of the motor

The contacts "Klixon" type depending on the temperature can be connected directly to the Drive through PIN 1 and 6 of the connectors DB9 Resolver. The type of sensors Klixon must be selected.

Remark!

The interface circuit of the motor PTC (or Klixon) must be considered and treated as a circuit of signal. The cables of connection towards the motor PTC must be formed by screened twisted pairs; the direction of the cable must not be parallel to that of the cables of the motor or must be far from these at least 20 cm. The Drives of the series SISP Drive are conceived for the adjustment of sinusoidal brushless motors.

4.2.2 Feedback devices

The SISP Drives can manage various feedback devices connected to the connector DB9 resolver or DB15 encoder. We can use:

- an incremental **encoder**, with zero impulse, with or without phases of commutation, configuration by two channels in framing or frequency and direction.
- a **resolver** for the feedback of a speed signal towards the regulator.
-

Importante!

The use of an encoder as transducer for the feedback of position, avoids to use the input in frequency both as speed reference and as position reference.

The use of an encoder with phases of commutation occupies both the encoder input and the output of encoder repetition; this last one, however, is occupied only during the phasing of the encoder and in the first moments when the motor runs, after each start. It is possible then for the user, to use both the reading of the phases of hall and the encoder repetition, suitably multiplexing the port.

The encoder/resolver should be coupled to the motor shaft with a connection having no mechanical clearances.

The cable of the encoder/resolver must be formed by twisted pairs with global screen, ground connected on both sides.

5. Chapter Electrical Connection

5.1. Access to the Terminals for electrical connections

REMARK!

Observe the safety instructions described in this manual. The equipment may be opened without the use of force.

Avvertenza!

Before accessing to the terminals of power or of Adjustment it is necessary to disconnect power supply from the Drive and await the discharge of the capacitors
The YELLOW LED on the left indicates the presence of voltage in the capacitors.

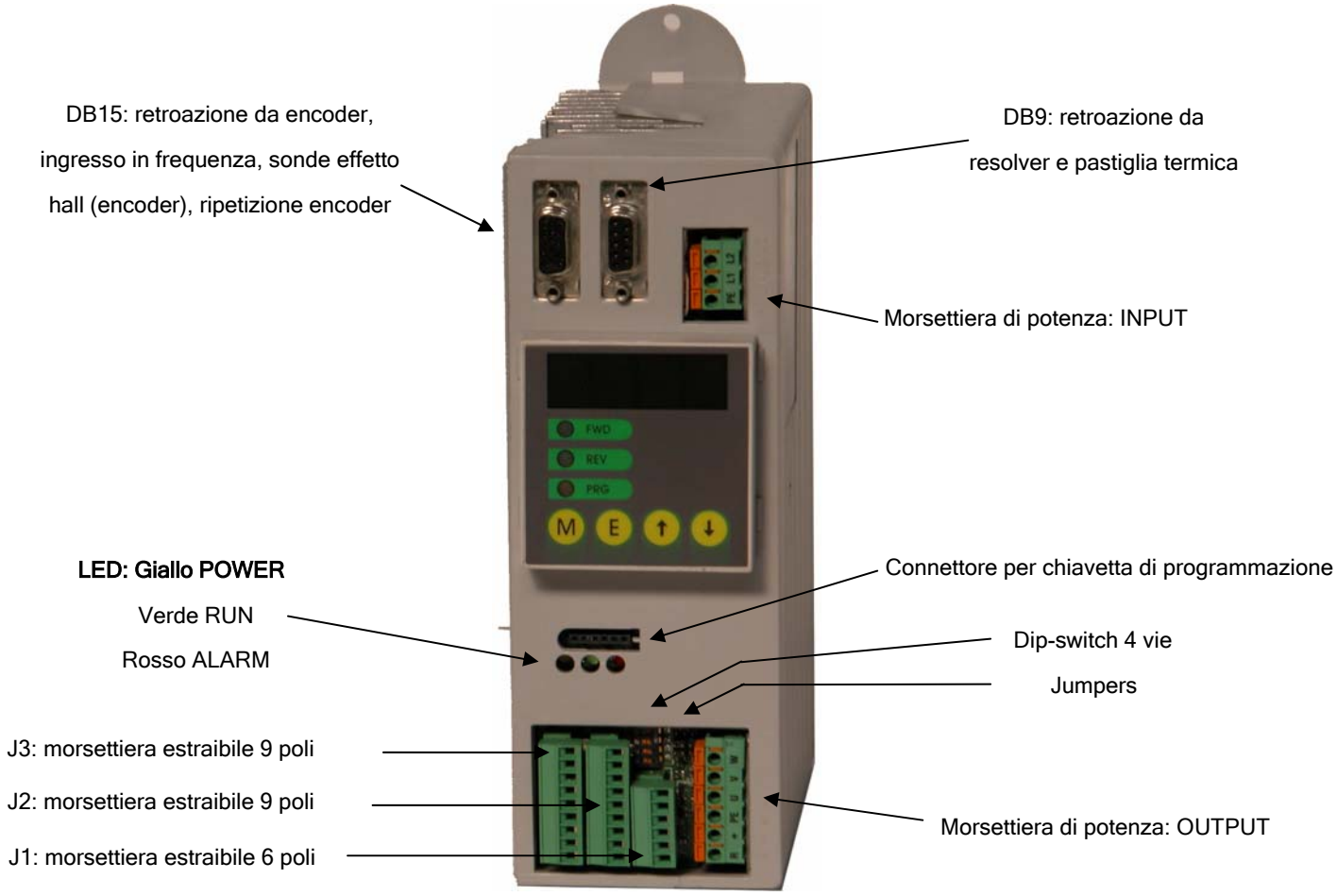


Figure 5.1.1: Access to the adjustment and power terminals

5.2. Part of Power

INPUT

●	●	●	●
PE	L1	L2	L3

OUTPUT

●	●	●	●	●	●
R	+	PE	U	V	W

In the models SISP 2M 5,5 - 11

●	●	●	●	●
R	+	U	V	W

the connection of the ground on the motor side must be performed on the terminal connected to the heatsink (screw M3)

Table 5.2.1.1: Connection and denomination of the power terminals INPUT / OUTPUT

NAME	FUNCTION	RANGE
PE	Ground connection (power supply side)	
L1	Power supply connection	220V-15% … 240V+10% 1Ph - 3Ph
L2		
L3	Existing only in the three-phase models	

NAME	FUNCTION	MAX
R	Connection for the braking resistance	Suggested: 100 ohm
+		
PE	Ground connection (motor side)	
U	Connection to the phases of the motor (do not swap them)	
V		
W		

5.2.1 Maximum Section of the power cables

DRIVE SISP		220V mono-trifase		400V
		2/4 4/8	6/12 8/16	2/4 4/8 6/12
L1,L2,L3,U,V,W	[mm^2]	1,5	2,5	1,5
+,R	[mm^2]	1,5	2,5	1,5
PE	[mm^2]	2	4	2

REMARK! Use exclusively cables in copper at 75°C.

Attenzione!

In case of short circuit to the ground on the output of the Drive the current in the ground cable of the motor can be a maximum of twice the value of the nominal current I2N.

5.2.2 Rectifier bridge and Intermediate Circuit

The voltage of mains is rectified and filtered through capacitors. For all the sizes it is mounted a diodes bridge with preload resistance.

In case of overvoltage in the intermediate circuit (signaling “OV”) or undervoltage (signaling “UV”) it is not possible to collect power from the intermediate circuit because the Drive bridge is blocked.

During the normal operation the voltage (DC) of the intermediate circuit UDC has a value equal to ULN *√2. When the motor is dragged by the load (in phase of speed reduction or braking), through the Drive bridge the energy flows into the intermediate circuit where, as a consequence, the voltage increases. At a specific value the voltage of the Drive is blocked, it is opened the contact of the relay programmed as signaling of the "alarm" status.

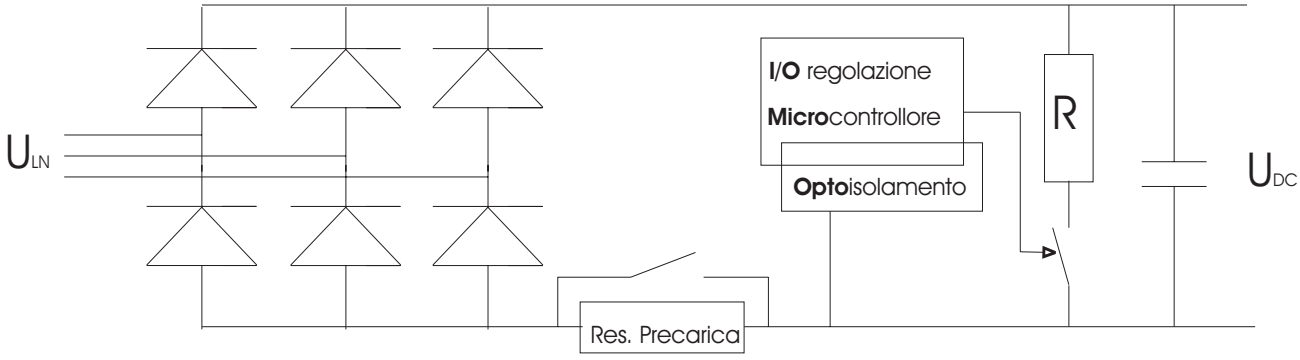


Figure 5.2.3.1 Rectifier bridge and intermediate circuit

It is possible to obtain the automatic restart of the Drive after an alarm condition has occurred

In some cases it is possible to avoid the block by extending the deceleration ramp.

5.2.3 Drive bridge

The Drive bridge is built with IGBT (Insulated Gate Bipolar Transistor) for all sizes. The Drive bridge is protected by the internal electronic circuits against overvoltage, overcurrent, short circuit between the phases and towards mass. In case of malfunction the Drive bridge is blocked and commutates the contact of the relay programmed as signaling of the "alarm" status.
It is possible to obtain the automatic restart of the Drive after that an alarm condition has occurred.

Alarm signallings for the protection of the Drive bridge

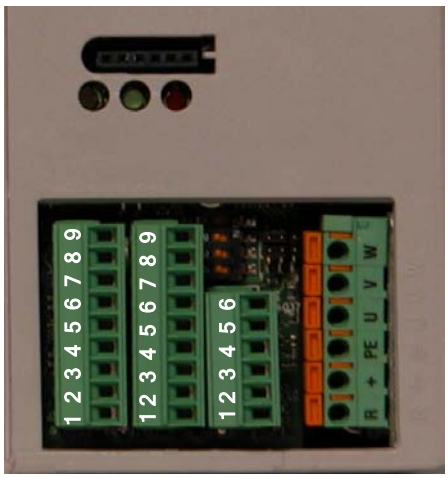
Signaling	Block caused by
OV	Overvoltage
OC	Overcurrent, Short circuit between the phases
OC	Short circuit towards ground

The variable voltage of output is obtained through modulation PWM of the voltage of the intermediate circuit. A special sinusoidal modulation produces together with the inductivity of the motor a curve with a very good sinusoidal envelope of the output current.

5.3. Part of Adjustment

5.3.1 Adjustment card

Figure 5.3.1.1: Terminal board of the adjustment card

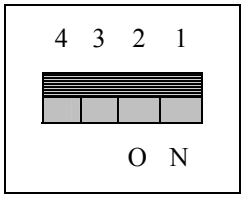


J3.9	
J3.8	
J3.7	AN-IN2+
J3.6	AN-IN2-
J3.5	AN-IN2+
J3.4	AN-IN1-
J3.3	AN-0UT
J3.2	+24V
J3.1	GND

J2.9	V-
J2.8	V+
J2.7	LNK-
J2.6	LNK+
J2.5	COM-EM
J2.4	DOUT1
J2.3	DOUT2
J2.2	REL-CM
J2.1	10V

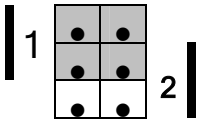
J1.6	COM-IN
J1.5	DIN1
J1.4	DIN2
J1.3	DIN3
J1.2	DIN4
J1.1	REL-NO

Dip-switches



Switch	Function when activated	Default
1	Configuration of Analog input 1 in current	Off
2	Configuration of Analog input 2 in current	Off
3	Termination of serial line LNK+	Off
4	Termination of serial line LNK-	Off

Jumpers

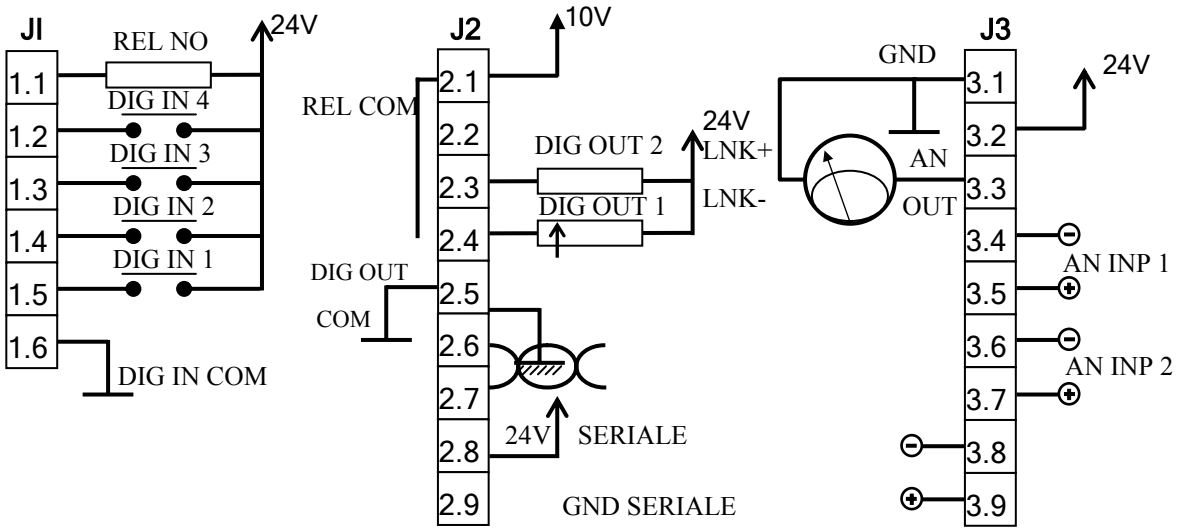


Position 1: LNK+ and LNK- connected to the serial (default)
Position 2: LNK+ and LNK- connected to the BUS CAN

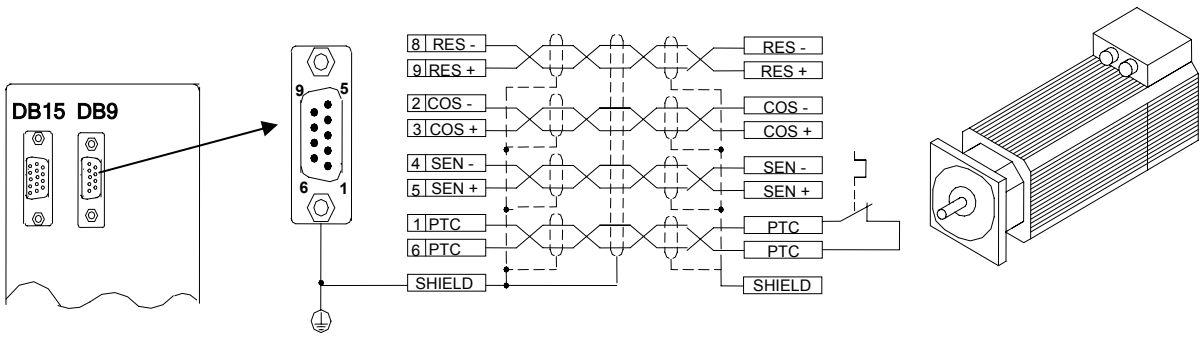
5.3.2 Denomination of the Terminals in the Adjustment card

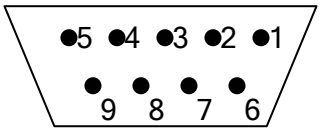
Pin	Name	Function	Maximum
J1.1	REL-NO	Relay terminal normally open	Max. switching voltage 110Vdc-125Vac
J1.2	DIN4	Digital input 4	Photocoupler: 6mA @ 24V
J1.3	DIN3	Digital input 3	Photocoupler: 6mA @ 24V
J1.4	DIN2	Digital input 2	Photocoupler: 6mA @ 24V
J1.5	DIN1	Digital input 1	Photocoupler: 6mA @ 24V
J1.6	COM-IN	Common mass of the digital inputs	
J2.1	10V	Output 10 V	10 mA
J2.2	REL-CM	Common terminal of the relay	Max. switching voltage 110Vdc-125Vac
J2.3	DOUT2	Digital output 2 (collector)	Photocoupler: 50mA, 50V
J2.4	DOUT1	Digital output 1 (collector)	Photocoupler: 50mA, 50V
J2.5	COM-EM	Common emitter of digital outputs	
J2.6	LNK+	Serial port or port CANBUS (see JUMPERS)	
J2.7	LNK-		
J2.8	V+	Power supply of the optoinsulated serial	8Vdc…30Vdc
J2.9	V-		
J3.1	GND	Mass	
J3.2	+24V	Output 24 V	24V +/-5% , 150mA
J3.3	AN-OUT	Analog output	5mA @ ±10V
J3.4	AN-IN1-	Negative terminal of the analog input 1	0.25 mA @ 0…±10V ; 10V @ 0…20 mA
J3.5	AN-IN1+	Positive terminal of the analog input 1	0.25 mA @ 0…±10V ; 10V @ 0…20 mA
J3.6	AN-IN2-	Negative terminal of the analog input 2	0.25 mA @ 0…±10V ; 10V @ 0…20 mA
J3.7	AN-IN2+	Positive terminal of the analog input 2	0.25 mA @ 0…±10V ; 10V @ 0…20 mA

Connection diagram (suggested) of the terminal board



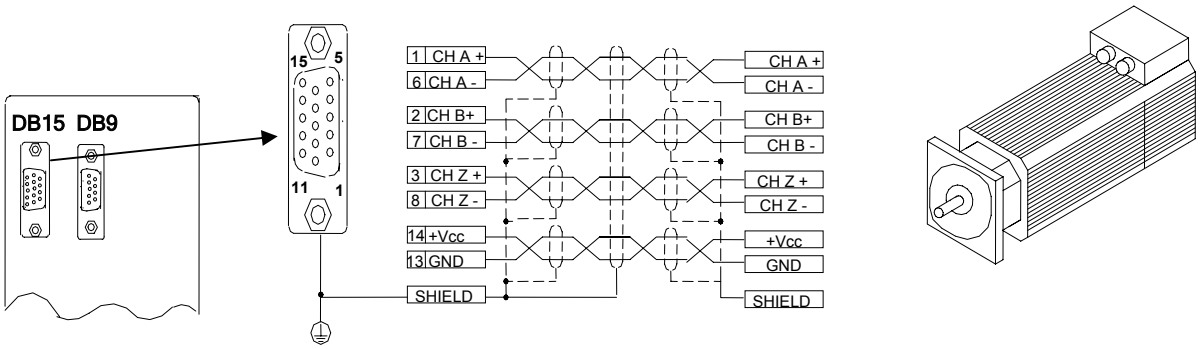
5.3.3 Denomination of the connector DB9 – Resolver



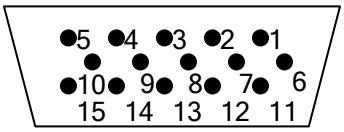


Pin	Function
1	Plug or PTC motor
2	Negative terminal of the cosine channel
3	Positive terminal of the cosine channel
4	Negative terminal of the sine channel
5	Positive terminal of the sine channel
6	Plug or PTC motor
7	Not connected
8	Negative terminal of energizing of the Resolver
9	Positive terminal of energizing of the Resolver

5.3.4 Denomination of the connector DB15 – Encoder



DB15 Encoders



Pin	Function
1	Positive terminal of channel A encoder
2	Positive terminal of channel B encoder
3	Positive terminal of channel Z encoder
4	Positive terminal of channel U phases of commutation or channel A encoder repetition
5	Positive terminal channel V phases of commutation or channel B encoder repetition
6	Negative terminal channel A encoder
7	Negative terminal channel B encoder
8	Negative terminal channel Z encoder
9	Negative terminal channel U phases of commutation or channel A encoder repetition
10	Negative terminal channel V phases of commutation or channel B encoder repetition
11	Positive terminal channel W phases of commutation or channel Z encoder repetition
12	Negative terminal channel W phases of commutation or channel Z encoder repetition
13	Mass
14	Power supply encoder (+5V or +24V selectable through parameter I.540)
15	Not connected

5.4. Typical Connection Diagrams

5.4.1 Connection of SISP Drve

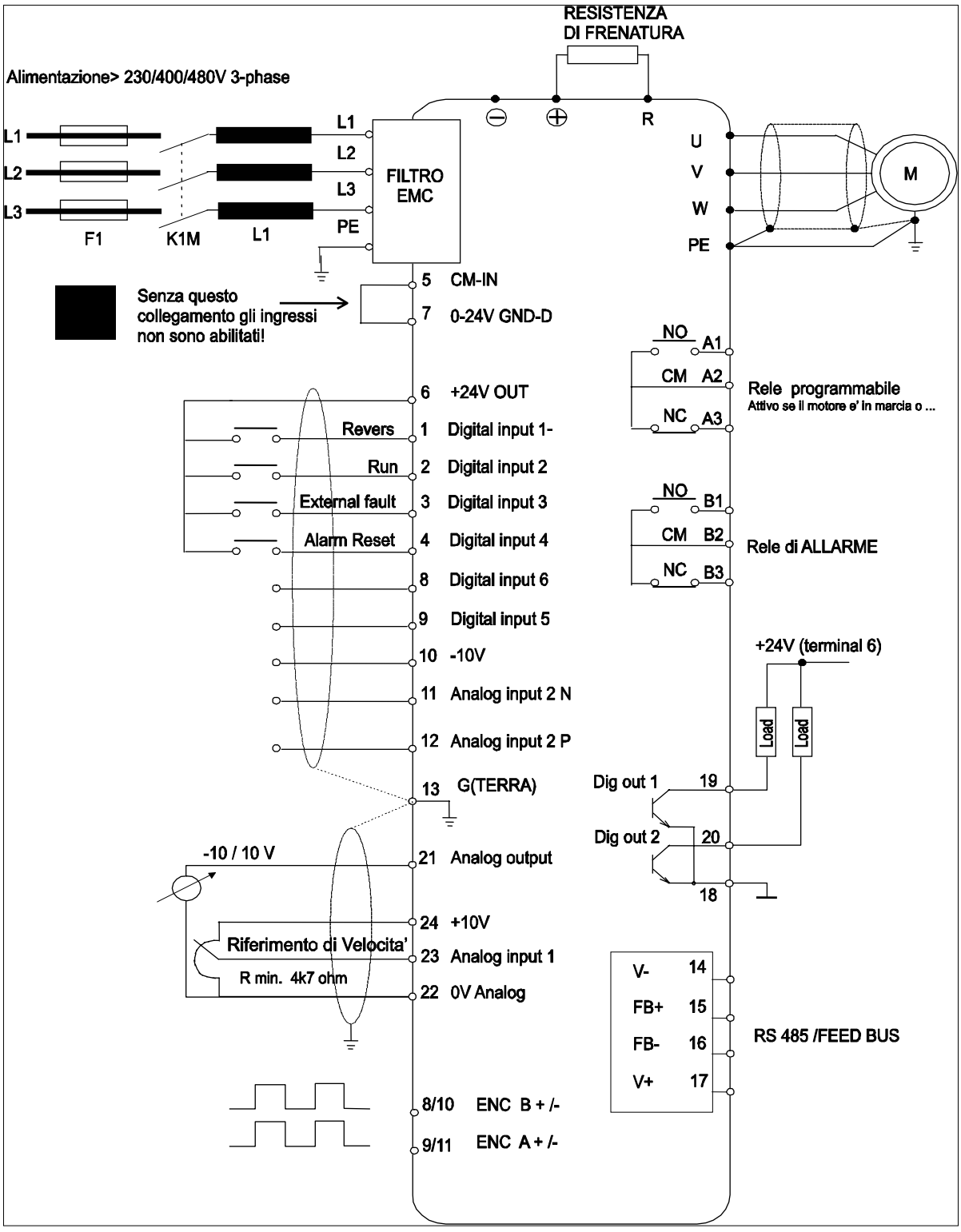


Figure 5.5.1.1: Command from terminal board, typical connection diagram

5.5. Inductors and Filters

REMARK!

For the Drive of the series SISP Drive, in order to limit the current of input RMS, it is possible to perform the introduction on the mains side of an inductor. The inductance must be supplied by a single phase inductor or by a mains transformer.

5.5.1 Inductors in Input

The mains inductor is suggested for all sizes:

- to increase the life of the capacitors of the intermediate circuit and reliability of the diodes of input
- to reduce the harmonic distortion of mains
- to reduce the problems caused by the power supply through a line of low impedance.

REMARK!

For the choice of the inductor ask information to the technical office of Sirco.

5.6. Braking with External Resistance

During the regenerative operation the voltage of the intermediate stage may rise up to the starting of the overvoltage alarm OV. Connecting a resistance of a suitable value (Ohm and W) to the terminals 'R' and '+' it is possible to dissipate the power accumulated in the capacitors reducing its voltage.
In this way it is possible to perform very short deceleration times even starting from high frequencies.

	Braking Resistor					Dimension mm			IP	Fig.
SISP ..... (230V.....480V)	Drive Size	Rmin. [ohm]	Value [ohm]	Power [Watt]	Code	A	B	D		
	1/2	50	100	240	**RRE-2,4-100R**	232	30	25	54	1
	2 / 4	50	100	240	**RRE-2,4-100R**	232	30	25	54	1
	4 / 8	50	100	240	**RRE-2,4-100R**	232	30	25	54	1
	6 / 12	50	100	240	**RRE-2,4-100R**	232	30	25	54	1
	8 / 16	50	100	240	**RRE-2,4-100R**	232	30	25	54	1

5.7. Level of Voltage of the Drive for safety operations

The minimum time gap that must elapse from the moment in which a SISP Drive is disconnected from the mains before that an operator may act on the internal parts of the Drive avoiding electric shocks is 180 seconds.

6. Chapter Use of the Drive Keyboard

In the following chapter we describe the operations of management of the parameters, through the programming keyboard of the Drive .

6.1. Keyboard of control and LED of signaling

Attenzione!

The modifications performed on the values of the parameters, even though they start immediately, are not stored in an automatic way but require a specific action of storage that is obtained through the command "C.000" [Save parameters].

M Scroll menu: Allows the passage from a parameters menu to the other (d.xxx, S.xxx, I.xxx, F.xxx, P.xxx, A.xxx and C.xxx).

E Key Enter: Used to initialize the setting of a parameter and/or confirm its value.

▲ Key UP: Used to increment the display of the parameters and/or their numeric value; furthermore it can be used to increment the reference of the motorpotentiometer, when it is displayed the parameter "F.000 - Motorpot ref" (menu F: FREQ & RAMP).

▼ Key DOWN: Used to decrement the display of the parameters and/or their numeric value.

▲ + ▼ Key UP + Key DOWN = RESET
When pressed together they perform the Reset of the Drive

Meaning of the LED :

Prg (Yellow led): Drive power supplied; blinking when a modification of a parameter has not been saved yet

Rew (Red led): Drive in Alarm status.

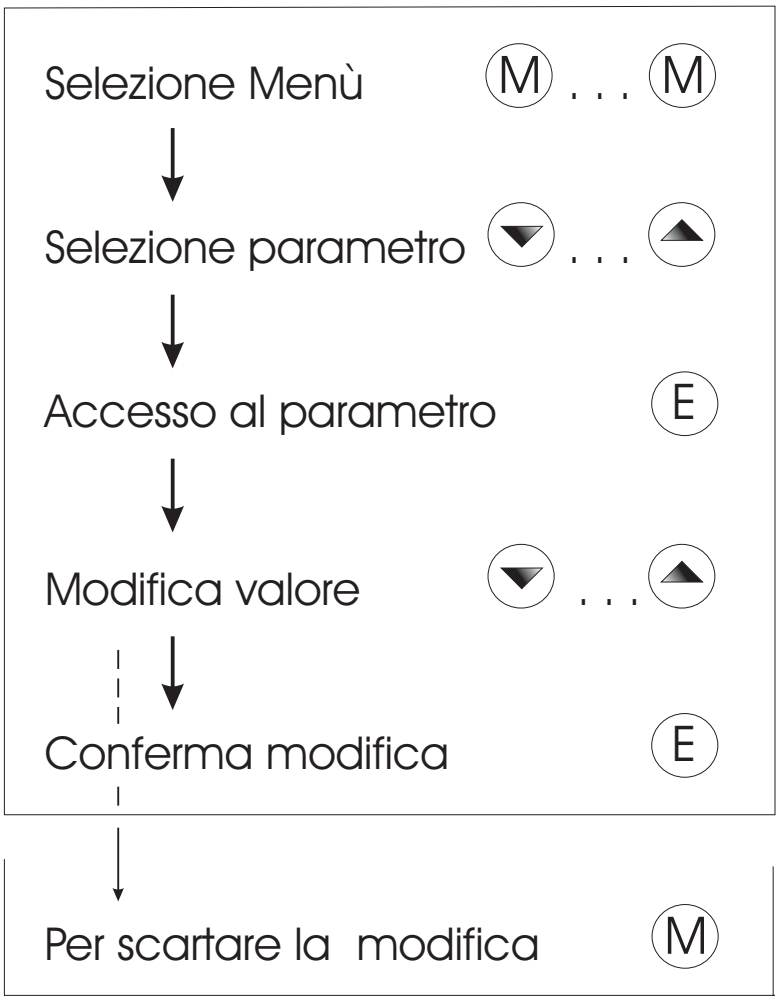
Fwd (Green led): Motor in revolution, command of Run enabled and activated .

Limit (Green led blinking): The control is limiting the current.

6.2. Menu scanning

Upon the startup of the Drive the display shall show automatically the parameter d.000 [Motor revolution speed] of the menu DISPLAY.

To display the value of the parameters, modify their value or to perform the functions C.xxx, perform the passages described:



Only for the Menu DISPLAY the passage to the displaying of the value is automatic after 2 seconds and it is not possible to modify it because it is a display-only menu.

6.3. Startup

6.3.1 Automatic calibration and phasing of the transducer

The SISP Drive accepts as transducer of position the following devices:

- a) Resolver
- b) Incremental Encoder by two channels or frequency/direction
- c) Encoder as on item b) and equipped with phases of commutation (phases of Hall)

During the automatic procedure it is also calculated the number of polar couples of the motor.
Caution: to complete the procedure of calibration and phasing of the transducer it is necessary that the motor moves; to do so, the parameters of the current and speed loops must be non null.
The phasing procedures for the three cases are:

Resolver:

Provide the command of phasing C.100
On the display appears “UU r”
Provide the command of RUN
On the display appears “runn”
Await the message “UU S”
Open the command of RUN
On the display appears “donE”
If satisfied with the phasing, save the parameters with the command C.000
During the phasing, the motor must be free to turn and perform at leas a complete mechanical revolution. If there are errors during the phasing, the procedure is interrupted and it is signaled the error on the display. CAUTION: in case of error remember to open the command of RUN.

Encoder:

Before proceeding with the phasing of the encoder it is necessary to set the type of encoder and the number of revolutions impulses (parameters P.160 and P.162). To allow the phasing it is necessary that the motor moves until reaching the zero mark of the encoder and from this point to perform a complete mechanical turn. For the rest the procedure for the encoder is identical to the one of the resolver except that upon each new startup of the machine a further procedure must be performed.
If the encoder has been previously phased, upon the startup of the Drive, on the display appears the message “UU r”.
Provide the command of RUN
On the display appears “runn”
Await the message “UU S”
Open the command of RUN
On the display appears “donE”
During this operation, the motor must be able to sufficiently turn to reach the zero mark.

Encoder with phases of commutation:
As in case a), with the difference that upon the start the Drive does not know yet its exact mechanical position but it can correctly make the motor turn. When the motor exceeds the zero mark, the measurement of the position is hooked to it.

6.3.2 Messages related to the phasing

Code	Description
UU r	Waiting the closing of the command of RUN
UU S	Waiting the opening of the command of RUN
Runn	Phasing in progress, motor power supplied and moving.
donE	Phasing performed correctly
PEbF	Phasing error: feedback corrupted
PEMd	Phasing error: the motor does not move
PEME	Phasing error: the motor moves in an incorrect way/it is dragged
PEMP	Phasing error: the phases of the motor are inverted
PEbP	Phasing error: the expected impulses for the encoder revolution do not correspond to those measured
PECU	Phasing error: the sine and cosine channels of the resolver are too unbalanced

7. Chapter Parameters Description

7.1. List of Parameters

Legend of the Drive menu content.

Menu **d** – DISPLAY Menu of read-only of the parameters (display).

Menu **S** – START-UP Menu for the setting of the basic parameters of the Drive.

Menu **I** – INTERFACE Menu for the setting of the inputs/outputs of the Drive (digital/analog).

Menu **P** – PARAMETER Menu for the setting of the parameters of the Drive functions.

Menu **C** – COMMAND Menu for the execution of functions on command (Parameters saving, Load default, Autocalibration, etc.)

Menu **H** - HIDDEN Menu not available from keyboard; reserved for the setting of the parameters of the Drive through serial line or field Bus.

REMARK!

The chapter 7 indicates the description of the code and the name of each of the Drive parameters and also the values of default and the ranges.
In the following chapter we indicate the functional descriptions of the single parameters of the Drive.

7.1.1 Menu d - Display

DISPLAY	Name	IPA	Parameter Description	Unit	Min	Max	Step
Basic	**d.000**	1	(i) Motor speed	rpm	-12000	12000	1
	d.001	2	Speed reference	rpm	-12000	12000	1
	d.002	3	Rotor position	count	0	4095	1
	d.003	4	Output current (rms)	Arms	0		0.1
	d.004	5	Current reference (rms)	Arms	0		0.1
	d.005	6	DC-Link voltage	V	0	400	1
Overload	**d.050**	7	Heatsink temperature	C°	0		1
	d.051	8	Drive overload (100% = alarm threshold)	%	0	100.0	0.1
	d.052	9	Motor overload (100% = alarm threshold)	%	0	100.0	0.1
	d.053	10	Braking resistor overload (100% = alarm threshold)	%	0	100.0	0.1
	d.054	11	Regulation Board temperature	C°	0	255	1
Input/Output	**d.100**	12	Drive digital command monitor				
	d.101	13	Terminal digital command monitor				
	d.102	14	Virtual digital command monitor				
	d.150	18	Drive digital status monitor				
	d.151	19	Terminal digital status monitor				
	d.152	20	Virtual digital status monitor				
	d.200	24	Analog inp 1 cnf monitor	count	0	4	1
	d.201	25	Drive analog inp 1 monitor	%	-100.0	100.0	0.1
	d.202	26	Terminal analog inp 1 monitor	%	-100.0	100.0	0.1
	d.210	27	Analog inp 2 cnf monitor	count	0	4	1
	d.211	28	Drive analog inp 2 monitor	%	-100.0	100.0	0.1
	d.212	29	Terminal analog inp 2 monitor	%	-100.0	100.0	0.1
Alarm list	**d.800**	44	last alarm memory	-			
	d.801	45	second to last alarm memory	-			
	d.802	46	third to last alarm memory	-			
	d.803	47	fourth to last alarm memory	-			
Drive Identification	**d.950**	48	Drive rated current	Arms			0.1
	d.951	49	Drive peak current	Arms			0.1
	d.952	50	software type	-			
	d.953	51	software revision	-			

	d.954	52	identification power code	-			
	d.955	53	identification parameter code	-			
	d.956	54	identification regulation code	-			
	d.957	55	identification start-up code	-			
	d.958	56	Drive size	-			
	d.959	57	Drive cfg type	-			
Utility	**d.999**	99	display test	-			

7.1.2 Menu S - STARTUP

START-UP	Name	IPA	Parameter description		Unit	Min	Max	step
Power Supply	**S.000**	410	**nominal main voltage**	**P.040**	Volts			
	S.001	411	**nominal main frequency**	**P.041**	Hz	50	60	10
Motor data	**S.050**	412	**motor rated current**	**P.060**	Arms	0		0.1
	S.051	413	**motor peak current**	**P.061**	Arms	0		0.1
	S.052	414	**motor poles**	**P.062**	-	2	60	2
	S.053	415	**Nominal speed**	**P.063**	rpm	1000	12000	1
	S.055	416	**motor thermal constant**	**P.065**	min	1	120	1
Commands & references	**S.100**	1200	**Operation mode**	**A.000**	-	1	4	1
	S.101	400	**commands source selector**	**P.000**	-	0	4	1
	S.102	305	**maximum reference speed**	**r.020**	rpm	1	12000	1
	S.103	307	**Speed reference 1 Source**	**r.050**	-	0	7	1
	S.104	311	**Digital Reference speed 0**	**r.100**	RPM	-r.020	r.020	1
	S.105	320	**acceleration FW**	**r.200**	s	0.00	99.99	0.01
	S.106	321	**deceleration FW**	**r.201**	s	0.00	99.99	0.01
	S.107	322	**acceleration REV**	**r.202**	s	0.00	99.99	0.01
	S.108	323	**deceleration REV**	**r.203**	s	0.00	99.99	0.01
	S.109	335	**maximum reference current**	**r.420**	Arms	0		0.1
	S.110	337	**Current reference 1 Source**	**r.450**	-	0	7	1
	S.111	341	**Digital Reference current 0**	**r.500**	Arms	0	r.420	0,1
Speed loop	**S.150**	403	**Speed loop proportional term 1**	**P.020**	-	0	32767	1
	S.151	404	**Speed loop integral term 1**	**P.021**	-	0	32767	1
	S.152	405	**Speed loop derivative term 1**	**P.022**	-	0	32767	1
Current Loop	**S.160**	426	**Current loop proportional term**	**P.120**	-	0	32767	1
	S.161	427	**Current loop integral term**	**P.121**	-	0	32767	1
Utility	**S.900**	806	**Auto phase**	**C.100**	-	0	1	1
	S.901	800	**Permanent storage of all parameters**	**C.000**	-	0	1	1

7.1.3 Menu I - INTERFACE

INTERFACE	Name	IPA	Parameter description	Unit	Min	Max	Step
Digital cmds main brd	**I.000**	100	**IN1 Dig command configuration**	-	0	30	1
	I.001	101	**IN2 Dig command configuration**	-	0	30	1
	I.002	102	**IN3 Dig command configuration**	-	0	30	1
	I.003	103	**IN4 Dig command configuration**	-	0	30	1
Digital status main board	**I.100**	112	**OUT1 Dig status configuration**	-	0	30	1
	I.101	113	**OUT2 Dig status configuration**	-	0	30	1
	I.102	114	**OUT3 Dig status configuration**	-	0	30	1
Analog input main board	**I.200**	120	**An Input 1 type**	-	0	2	1
	I.201	121	**An Input 1 offset**	%	-99.9	99.9	0.1
	I.202	122	**An Input 1 gain**	-	-9.99	9.99	0.01
	I.203	123	**An Input 1 min**	-	0	99.99	0.01
	I.204	124	**An Input 1 time constant**	s	0.001	0.25	0.001
	I.205	125	**An Input 1 clip level**	V	0.00	2.50	0.01
	I.210	126	**An Input 2 type**	-	0	2	1
	I.211	127	**An Input 2 offset**	%	-99.9	99.9	0.1
	I.212	128	**An Input 2 gain**	-	-9.99	9.99	0.01
	I.213	129	**An Input 2 min**	-	0	99.99	0.01
	I.214	130	**An Input 2 time constant**	s	0.001	0.25	0.001
	I.215	131	**An Input 2 clip level**	V	0.00	2.50	0.01
Analog output main board	**I.300**	137	**An output configuration**	-	0	9	1
	I.301	138	**An output offset**	-	-9.99	9.99	0.01
	I.302	139	**An output gain**	-	-9.99	9.99	0.01
	I.303	140	**An output time constant**	s	0	2.5	0.01
Enabling virtual IO	**I.400**	149	**Digital commands setting by serial line enabling**	-	0	255	1
	I.420	150	**Digital states setting by serial line enabling**	-	0	15	1
	I.450	151	**An output setting by serial line enabling**	-	0	255	1
Primary encoder config	**I.500**	152	**Frequency Reference ChConf**	-	0	1	1
	I.501	153	**Frequency Reference pulses**	ppr	1	8192	1
Secondary encoder config	**I.520**	154	**Encoder repetition enabling + ChConf**	-	0	2	1
	I.521	155	**Encoder repetition pulses**	ppr	20	8192	1
Encoder supply config	**I.540**	156	**Primary and Secondary encoder supply**	-	0	1	1

			selection				
Serial config	**I.600**	157	**serial line configuration protocol & mode**	-	1	5	1
	I.601	158	**serial line baudrate**	-	4	9	1
	I.602	159	**serial line address**	-	0	99	1
	I.603	160	**serial line answer delay time**	ms	0	250	2
	I.604	161	**serial line timeout on reception**	s	0.0	25.0	0.1
	I.605	162	**serial line enable timeout alarm**	-	0	1	1
SBI configuration	**I.750**	163	**SBI Address**	-	0	255	1
	I.751	164	**CAN Baud Rate**	-	0	6	1
	I.752	165	**SBI Profibus Mode**	-	0	4	1
	I.753	166	**CAN Mode**	-	0	2	1
	I.754	167	**Bus flt holdoff**	s	0	60	0.1
	I.760	168	**Sbi to Drv W0**	-	0	1999	1
	I.761	169	**Sbi to Drv W1**	-	0	1999	1
	I.762	170	**Sbi to Drv W2**	-	0	1999	1
	I.763	171	**Sbi to Drv W3**	-	0	1999	1
	I.764	172	**Sbi to Drv W4**	-	0	1999	1
	I.765	173	**Sbi to Drv W5**	-	0	1999	1
	I.770	174	**Drv to Sbi W0**	-	0	1999	1
	I.771	175	**Drv to Sbi W1**	-	0	1999	1
	I.772	176	**Drv to Sbi W2**	-	0	1999	1
	I.773	177	**Drv to Sbi W3**	-	0	1999	1
	I.774	178	**Drv to Sbi W4**	-	0	1999	1
	I.775	179	**Drv to Sbi W5**	-	0	1999	1

7.1.4 Menu r - REFERENCES

REFERENCES	Name	IPA	Parameter description	Unit	Min	Max	Step
Motopotenziometer speed	**r.000**	300	**Motopotenziometer speed reference**	RPM	0	r.020	1
	r.010	301	**Motopotenziometer speed acc dec time for**	s	0.1	999.9	0.1
	r.011	302	**Motopotenziometer speed min**	RPM	0	12000	1
	r.012	303	**Motopotenziometer speed bipolar**	-	0	1	1
	r.013	304	**Motopotenziometer speed with auto save**	-	0	1	1
Speed reference limit	**r.020**	305	**maximum reference speed**	RPM	10	12000	1
Speed reference sources	**r.050**	307	**Speed reference 1 Source**	-	0	8	1
	r.051	308	**Speed reference 2 Source**	-	0	8	1
	r.060	309	**Multi speed Sel Channel 1 source**	-	0	8	1
	r.061	310	**Multi speed Sel Channel 2 source**	-	0	8	1
Multi speed function	**r.100**	311	**Digital speed Reference 0**	RPM	-r.020	r.020	1
	r.101	312	**Digital speed Reference 1**	RPM	-r.020	r.020	1
	r.102	313	**Digital speed Reference 2**	RPM	-r.020	r.020	1
	r.103	314	**Digital speed Reference 3**	RPM	-r.020	r.020	1
	r.104	315	**Digital speed Reference 4**	RPM	-r.020	r.020	1
	r.105	316	**Digital speed Reference 5**	RPM	-r.020	r.020	1
	r.106	317	**Digital speed Reference 6**	RPM	-r.020	r.020	1
	r.107	318	**Digital speed Reference 7**	RPM	-r.020	r.020	1
	r.108	319	**Jogging speed**	RPM	-r.020	r.020	1
Ramp config	**r.200**	320	**acceleration CW (Clock Wise)**	s	0.00	99.99	0.01
	r.201	321	**deceleration CW**	s	0.00	99.99	0.01
	r.202	322	**acceleration CCW (Counter Clock Wise)**	s	0.00	99.99	0.01
	r.203	323	**deceleration CCW**	s	0.00	99.99	0.01
	r.204	324	**acceleration CW 2**	s	0.00	99.99	0.01
	r.205	325	**deceleration CW 2**	s	0.00	99.99	0.01
	r.206	326	**acceleration CCW 2**	s	0.00	99.99	0.01
	r.207	327	**deceleration CCW 2**	s	0.00	99.99	0.01
	r.250	328	**S-curve characteristic**	s	0.0	10.00	0.1
	r.260	329	**Ramp extension source**	-	0	2	1
Motopotenziometer	**r.400**	330	**Motopotenziometer current reference**	Arms	0	r.420	0.1
	r.410	331	**Motopotenziometer current acc dec time for**	s	0.1	999.9	0.1
	r.411	332	**Motopotenziometer current min**	Arms	0	1.0	0.1
	r.412	333	**Motopotenziometer current bipolar**	-	0	1	1
	r.413	334	**Motopotenziometer current with auto save**	-	0	1	1
Current reference limit	**r.420**	335	**maximum reference current**	Arms	r.421	d.950	0.1
	r.421	336	**minimum reference current**	Arms	0	r.420	0,1

Current reference sources	**r.450**	337	**Current reference 1 Source**	-	0	8	1
	r.451	338	**Current reference 2 Source**	-	0	8	1
	r.460	339	**Multi current reference Sel Channel 1 source**	-	0	8	1
	r.461	340	**Multi current reference Sel Channel 2 source**	-	0	8	1
Multi current ref function	**r.500**	341	**Digital Reference current 0**	Arms	0	r.420	0,1
	r.501	342	**Digital Reference current 1**	Arms	0	r.420	0,1
	r.502	343	**Digital Reference current 2**	Arms	0	r.420	0,1
	r.503	344	**Digital Reference current 3**	Arms	0	r.420	0,1
	r.504	345	**Digital Reference current 4**	Arms	0	r.420	0,1
	r.505	346	**Digital Reference current 5**	Arms	0	r.420	0,1
	r.506	347	**Digital Reference current 6**	Arms	0	r.420	0,1
	r.507	348	**Digital Reference current 7**	Arms	0	r.420	0,1

7.1.5 Menu P - PARAMETER

PARAMETERS	Name	IPA	Parameter description	Unit	Min	Max	Step
Commands	**P.000**	400	**Commands source selector**	-	0	4	1
	P.001	401	**Reversal enabling**	-	0	1	1
	P.002	402	**Safe start**	-	0	1	1
Speed loop	**P.020**	403	**Speed loop proportional term 1**	%	0.00	100.00	0.01
	P.021	404	**Speed loop integral term 1**	%	0.00	100.00	0.01
	P.022	405	**Speed loop derivative term 1**	%	0.00	100.00	0.01
	P.023	406	**Speed loop proportional term 2**	%	0.00	100.00	0.01
	P.024	407	**Speed loop integral term 2**	%	0.00	100.00	0.01
	P.025	408	**Speed loop derivative term 2**	%	0.00	100.00	0.01
	P.026	409	**Speed loop thr speed**	RPM	0	10000	1
Power Supply	**P.040**	410	**nominal main voltage**	V			
	P.041	411	**nominal main frequency**	Hz	50	60	10
Motor Data	**P.060**	412	**motor rated current**	Arms	0		0.1
	P.061	413	**motor peak current**	Arms	0		0.1
	P.062	414	**motor pole**	-	2	60	2
	P.063	415	**Nominal speed**	rpm	1000	12000	1
	P.065	416	**motor thermal constant**	min	1	120	1
	P.066	460	**Motor Stator Inductance**	mH	0.00	100.00	0.01
	P.067	461	**Motor Stator Resistance**	Ohm	0.00	100.00	0.01
Output speed Limits	**P.080**	417	**maximum output speed CW**	%	0	110	1
	P.081	418	**maximum output speed CW mode**	-	0	2	1
	P.082	419	**Minimum output speed CW**	%	0.0	25.0	0.1
	P.083	420	**maximum output speed CCW**	%	0	110	1
	P.084	421	**maximum output speed CCW mode**	-	0	2	1
	P.085	422	**Minimum output speed CCW**	-	0.0	25.0	0.1
Output current Limits	**P.100**	423	**maximum output current**	%	0	100	1
	P.101	424	**maximum output current mode**	-	0	2	1
	P.102	425	**Minimum output current**	%	0.0	25.0	0.1
Current loop	**P.120**	426	**Current loop proportional term**	%	0.00	100.00	0.01
	P.121	427	**Current loop integral term**	%	0.00	100.00	0.01
Primary feedback	**P.160**	428	**Primary feedback selection**	-	0	4	1
	P.161	429	**Rotor position offset**	count	0	65535	1
	P.162	430	**Feedback Encoder PPR**	ppr	1	8192	1
Overspeed	**P.180**	433	**Antifugue control**	-	0	1	1
	P.181	434	**Overspeed level**	%	0	120	1
Motor overload config	**P.220**	435	**Enabling of motor overload protection**	-	0	1	1

BU config	**P.240**	436	**enabling of braking resistor overload protection**	-	0	1	1
	P.241	437	**ohmic value of braking resistor**	Ohm	1	250	1
	P.242	438	**braking resistor power**	kW	0.01	25.00	0.01
	P.243	439	**braking resistor thermal constant**	s	5	1250	5
Undervoltage config	**P.260**	440	**undervoltage threshold**	%	0	80	1
	P.261	441	**Max powerloss time**	s	0.0	25.0	0.1
	P.262	442	**enabling of undervoltage alarm storage**	-	0	1	1
Autoreset config	**P.280**	444	**number of autoreset attempts**	-	0	255	1
	P.281	445	**enabling of automatic reset of autorestart attempts**	Min	0	250	1
	P.282	446	**autoreset time delay**	s	0.1	60.0	0.1
	P.283	447	**alarm contact during autoreset**	-	0	1	1
Ext fault config	**P.300**	448	**external fault mode**	-	0	3	1
Phase Loss config	**P.310**	449	**Phase Loss detection enable**	-	0	1	1
Speed threshold	**P.340**	450	**speed 1 level detection**	RPM	0	12000	1
	P.341	451	**hysteresis amplitude related to P-340**	RPM	1	1000	1
	P.342	452	**speed 2 level detection**	RPM	0	12000	1
	P.343	453	**hysteresis amplitude related to P-342**	RPM	1	1000	1
Steady statand signaling	**P.360**	454	**tolerance at constant speed**	RPM	0	250	1
	P.361	455	**ramp end signaling delay**	s	0.1	25.0	0.1
Heatsink temperature thr	**P.380**	456	**Heatsink temperaturand signaling level**	C°	10	110	1
	P.381	457	**Hysteresis band related to P-380**	C°	0	10	1
Display Settings	**P.420**	459	**Display IPA at start up**	-	1	1999	1
Protection	**P.999**	799	**parameters protection code**	-	0	3	1

7.1.6 Menu A - APPLICATION

APPLICATIONS	Name	IPA	Parameter description	Unit	Min	Max	Step
General settings	**A.000**	1200	**Operation mode**	-	0	4	1

7.1.7 Menu C - COMMAND

COMMANDS	Name	IPA	Parameter description	Unit	Min	Max	Step
Basic	**C.000**	800	**Permanent storage of all parameters**	-	0	1	1
	C.001	801	**Recall of previously stored parameters**	-	0	1	1
	C.002	802	**Load Deafult**	-	0	1	1
Alarm Reset	**C.020**	803	**Zero setting of alarms memory**	-	0	1	1
External Key	**C.040**	804	**Recall the parameters contained in the external key**	-	0	1	1
	C.041	805	**Storage the parameters on external key**	-	0	1	1
Tuning	**C.100**	806	**Auto phase**	**-**	0	1	1

(#) Command from serial, valid for all Functions C.XXX

8. Menu d - DISPLAY

Basic

d.000 – Output Speed (Output speed)

Speed of the rotor measured [RPM]

d.001 – Speed Reference (Speed Reference)

Current Speed reference [RPM]

d.002 – Rotor position (Rotor position)

Current position of the rotor in relation to the zero of the resolver or to the zero mark of the encoder. The field of variation of the position is normalized at 12 bit (0-4095). [counts]

d.003 – Output Current (Output Current)

Current in output measured. [Arms]

d.004 – Output Current (Output Current)

Present current reference [Arms]

d.005 – DC link Voltage (Voltage DC-Bus)

Direct voltage of the capacitors of the dc-link (DC-Bus). [Vdc]

Overload

d.050 – Heatsink Temperature (Temperature of the Heatsink)

Temperature of the heatsink of the Drive. In the machines in which there is not the heatsink sensor of temperature, the value is fixed at 20°. [°C]

d.051 – Drive Overload (Overload of the Drive)

Thermal image of the Drive, when it reaches the 100% it is activated the alarm OLi. [%]

d.052 – Motor Overload (Overload of the Motor)

Thermal image of the motor, when it reaches the 100% it is activated the alarm OL. [%]

d.053 – Braking Resistor Overload (Overload of the Resistance of Braking)

Thermal image of the resistance of braking, when it reaches the 100% it is activated the alarm OLr. [%]

d.054 – Regulation Board Temperature (Temperature of the Adjustment card)

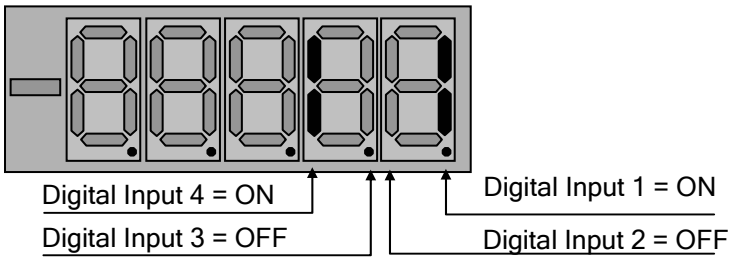
Temperature of the adjustment card, when it reaches the maximum value for the card, it is activated the alarm OHr. [°C]

Inputs/Outputs

d.100 – Digital Input Status (Status of the Digital inputs)

Status of the digital inputs as they are acquired and interpreted by the Drive. It may come from the terminal board or from serial line or field bus.

Example of display on display with 7 segments 5 digits and sign:



d.101 – Terminal Digital Input Status (Terminal Digital Input Status)

Status of the digital inputs on the terminal board of the adjustment card of the Drive.

See example d.100

d.102 – Virtual Digital Input Status (Virtual Digital Input Status)

Status of the digital inputs received from serial line or field bus.

See example d.100

d.150 – Digital Output Status (Digital Output Status)

Status of the digital outputs as on the terminal board or on serial line or field bus.

See example d.100

d.151 – Terminal Digital Output Status (Terminal Digital Output Status)

Status of the digital outputs on the terminal board of the adjustment card of the Drive.

See example d.100

d.152 – Virtual Digital Output Status (Virtual Digital Output Status)

Status of the digital outputs on serial line or field bus.

See example d.100

d.200 – Analog Input 1 Cnf Monitor (Analog Input 1 Cnf Monitor)

Display of the programming of the analog input 1; it displays the current configuration according tot

he following codification:

[0]	Null funct	No function programmed
[1]	Speed Ref 1	Speed reference 1
[2]	Speed Ref 2	Speed reference 2
[3]	Mult Speed 1	Multispeed reference channel 1
[4]	Mult Speed 2	Multispeed reference channel 2
[5]	Max Curr SM	Maximum current(couple) in *Speed Mode*
[6]	Curr Ref 1	Current reference 1
[7]	Curr Ref 2	Current reference 2
[8]	Mult Curr 1	Reference of multi current channel 1
[9]	Mult Curr 2	Reference of multi crrente channel 2
[10]	Max Spd CMCW	Maximu speed clockwise in *Current Mode*
[11]	Max Spd CM CCW	Maximu speed anticlockwise in *Current Mode*
[12]	Ramp Ext	Factor of extension of the ramps (not implemented)

d.201 – Analog Input 1 Monitor (Analog Input 1 Monitor- Output block)

Percentage display of the value in output from the conditioning block of the analog input 1. [%]

d.202 – An. Inp. 1 Terminal Mon. (Analog Input Monitor 1 – Input block)

Percentage display of the value in input to the conditioning block of the analog input 1.[%]

d.210 – Analog Input 2 Cnf Monitor (Analog Input 2 Configuration Monitor)

Display of the programming of the analog input 1; it displays the current configuration according to the codification indicated in d.200.

d.211 – Analog Input 2 Monitor (Analog Input 2 Monitor- Output block)

Percentage display of the value in output from the conditioning block of the analog input 2. [%]

d.212 – An. Inp. 2 Terminal Mon. (Analog Input 2 Terminal Monitor – Input block)

Percentage display of the value in input to the conditioning block of the analog input 2.[%]

Alarms list

d.800 – Last Alarm Memory (Last Alarm Memory)

Last alarm stored in the alarms list of the Drive.

d.801 – Second to Last Alarm Memory (Second to Last Alarm Memory)

Second to last alarm stored in the alarms list of the Drive.

d.802 – Third to Last Alarm Memory (Third to Last Alarm Memory)

Third to last alarm stored in the alarms list of the Drive.

d.803 – Fourth to Last Alarm Memory **(Fourth to Last Alarm Memory)**

Fourth to last alarm stored in the alarms list of the Drive.

Identification of the Drive

d.950 – Drive Rated Current **(Drive Rated Current)**

d.951 – Drive Peak Current **(Drive Peak Current)**

d.952 – Software Version (1/2) **(Software Version – part 1)**

Example of display: 07.00

d.953 – Software Version (2/2) **(Software Version – part 2)**

Example of display: 00.00

d.954 – Power Identification Code **(Identification Code File Power)**

Reserved

d.955 – Parameters Identification Code **(Parameters Identification Code File)**

Reserved

d.956 – Regulation Config Identification Code **(Regulation Configuration Identification Code)**

Reserved

d.957 – Start-Up Identification Code **(Start-Up Identification Code File)**

Reserved

d.958 – Drive Size **(Drive Size)**

Reserved

d.959 – Drive Configuration Type **(Drive Configuration Type)**

Reserved

Utility

d.999 – Display Test **(Display Test of the Drive)**

It starts all segment and leds of the Drive to test their functionality.

8.1. Menu S – START-UP

REMARK!

The menu START-UP contains a group of parameters and functions that allow a fast startup of the Drive and of the related motor.

All these parameters are also duplicated in other menus of the Drive.

The modification of one of these automatically involves the updating of the twin parameter, but their collection in the Start-Up menu shall facilitate the startup in most applications when the Drive is inserted in simple systems.

For the description of the parameters consult the explanations contained in the paragraphs related to the corresponding parameters indicated in the column 'alias'.

8.2. Menu I - INTERFACE

Digital inputs of the Adjustment card

I.000 – Digital Input 1 Configuration (Digital Input 1 Configuration)

Function associated to the digital input 1 according to the scheme below:

0	No function associated
1	Run/Enabling
2	Inversion of the reference
3	Reference null
4	External fault NO (normally open, activated closed)
5	External fault NC (normally closed, activated open)
6	Reset alarm
7	Command of jogging
8	References selection 1
9	References selection 2
10	References selection 3
11	Selection of first set of accel./decel. ramps
12	Enabling inverter NO (normally open, activated closed)
13	Enabling inverter NC (normally closed, activated open)
14	Enabling ramp
15	Increment motopotentiometer speed
16	Decrement motorpotentiometer speed
17	Reset motorpotentiometer speed
18	Increment motorpotentiometer current
19	Decrement motorpotentiometer current
20	Reset motorpotentiometer current

21	Start positioning (not implemented)
22	References selection position 1 (not implemented)
23	References selection position 2 (not implemented)
24	References selection position 3 (not implemented)
25	References selection position 4 (not implemented)
26	References selection position 5 (not implemented)
27	Reset of the positioning cycle (not implemented)
28	Start preset (not implemented)
29	Zero position (not implemented)
30	Selection set2 of the gains of the speed loop

I.001 – Digital Input 2 Configuration (Digital Input 2 Configuration 2)

Function associated to the digital input 2. See I.000.

I.002 – Digital Input 3 Configuration (Digital Input 3 Configuration)

Function associated to the digital input 3. See I.000.

I.003 – Digital Input 4 Configuration (Digital Input 4 Configuration)

Function associated to the digital input 4. See I.000.

Digital outputs of the Adjustment card

I.100 – Digital Output 1 Configuration (Digital Output 1 Configuration)

Function associated to the digital output 1 as indicated in the scheme below:

0	Drive ready
1	Drive in alarm
2	Drive not in alarm
3	Motor running
4	Motor stopped (not power supplied)
5	Anticlockwise revolution
6	Reference reached (steady status)
7	Execution of the ramp
8	Run in status of undervoltage (UV)
9	Couple in output greater than the threshold
10	Reserved
11	Extern fault
12	No extern fault

13	Timeout of the serial	
14	Output speed equal to the threshold 1	
15	Output speed different from the threshold 1	
16	Output speed greater than the threshold 1	
17	Output speed lower than the threshold 1	
18	Output speed equal to the threshold 2	
19	Output speed different from the threshold 2	
20	Output speed greater than the threshold 2	
21	Output speed lower than the threshold 2	
22	Heatsink temperature equal to the threshold	*(not enabled)*
23	Heatsink temperature different from the threshold	*(not enabled)*
24	Heatsink temperature greater than the threshold	(*not enabled)*
25	Heatsink temperature lower than the threshold	*(not enabled)*
26	Emergency stop	
27	Bit 1 of the positioning zone	(not implemented)
28	Bit 0 of the positioning zone	(not implemented)
29	Motor stopped in couple	
30	Port 2 Encoder used for the phasing with phases of commutation (Hall Effects)	

I.101 – Digital Output 2 Configuration (Digital Output 2 Configuration)

Function associated to the digital output 2. See I.100.

I.102 – Digital Output 3 Configuration (Digital Output 3 Configuration)

Function associated to the digital output 3. See I.100.

Analog inputs of the Adjustment card

The drawing below describes the block diagrams of the "standard analog inputs" of the Drive.

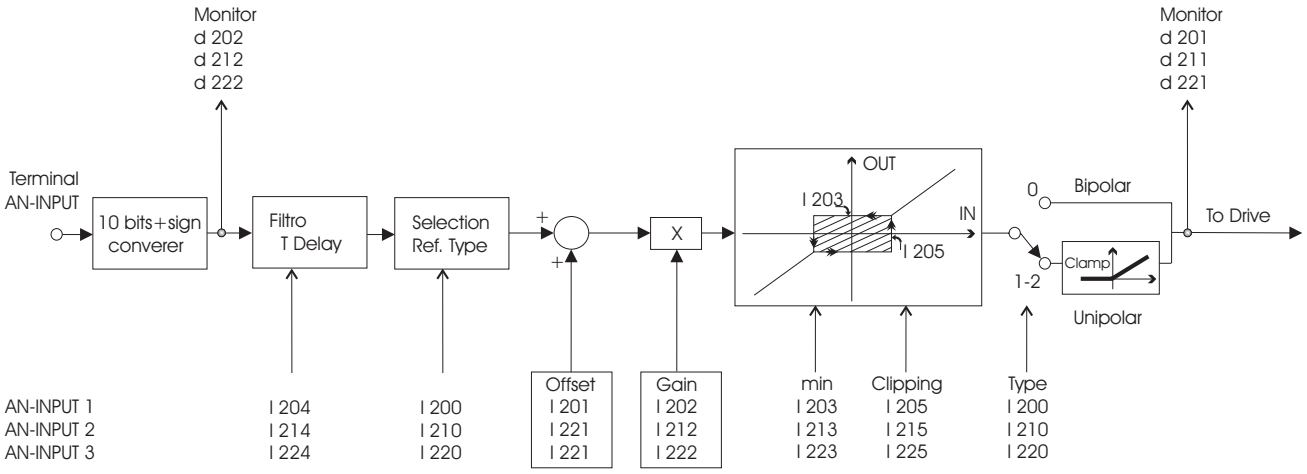


Figure 7.4.1: Logic Analog inputs

The adjustment card provides as standard 2 analog inputs.
Resolution of analog inputs:

setting in voltage: 11 bits (10 bits + sign)
setting in current: 10 bits

A description of the basic connections is indicated in figure 5.5.1.1.

The assignment to an analog input of a specific function is described in the chapter FREQUENCIES & RAMPS.

I.200 – Analog Input 1 Type (Configuration of the analog input 1)

Setting of the analog input 1, according to the of the type of control.

I.200 = 0 ±10V, ±0-20mA
I.200 = 1 0-10V, 0-20mA
I.200 = 2 4-20mA

To make effective the control in current remember to bring in position 'ON' the microswitches 1 (analog input 1) and/or 2 (analog input 2).

I.201 – Analog Input 1 Offset (Analog Input 1 Offset)

Setting of the offset of the analog input 1.

I.202 – Analog Input 1 Gain (Analog Input 1 Gain)

Setting of the gain of the analog input 1.

I.203 – Analog Input 1 Minimum (Analog Input 1 Minimum)

Setting of the minimum of the analog input 1. The value set (in %) is the lower limit for the output of the conditioning stage of the analog signal.

I.204 – Analog Input 1 Filter (Analog Input 1 Filter)

Constant of time for the filter of the analog input 1.

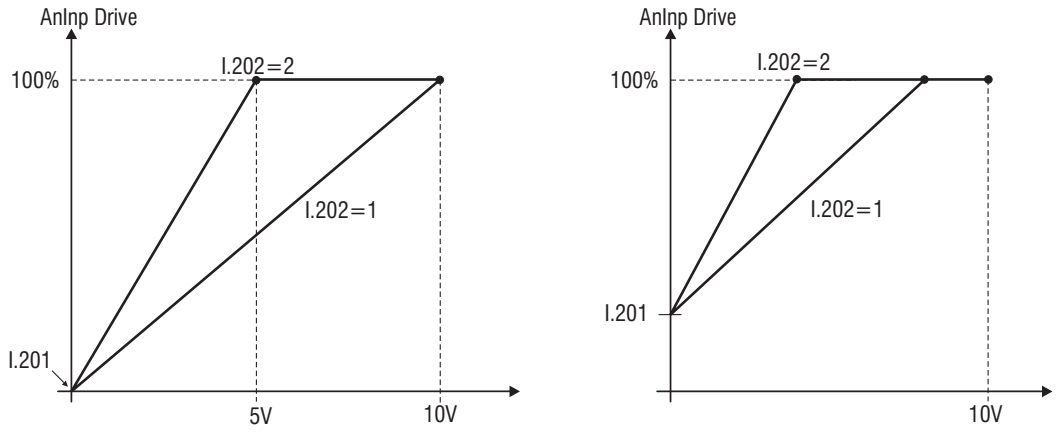


Figure 7.4.2: Scaling of Analog input 1

I.205 – Analog Input 1 Clip Level (Analog Input 1 Clip Level)

Level of clipping of the analog input 1. The voltages (corrected by the offset but not of the gain) lower than the value set (V) are considered null.

I.210 – Analog Input 2 Type (Analog Input 2 configuration)

Setting of the analog input 2, according to the type of control.
See I.200.

I.211 – Analog Input 2 Offset (Analog Input 2 Offset)

Setting of the offset of the analog input 2.

I.212 – Analog Input 2 Gain (Analog Input 2 Gain)

Setting of the gain of the analog input 2.

I.213 – Analog Input 2 Minimum (Analog Input 2 Minimum)

Setting of the minimum of the analog input 2. The value set (in %) is the lower limit for the output of the conditioning stage of the analog signal.

I.214 – Analog Input 2 Filter (Analog Input 2 Filter)

Constant of time for the filter of the analog input 2.

I.215 – Analog Input 2 Clip Level (Analog Input 2 Clip Level)

Level of clipping of the analog input 2. The voltages (corrected by the offset but not by the gain) lower to the value set (V) are considered null.

Analog outputs of the Adjustment card

The drawings below describe the blocks diagram of the "standard analog outputs" of the Drive.

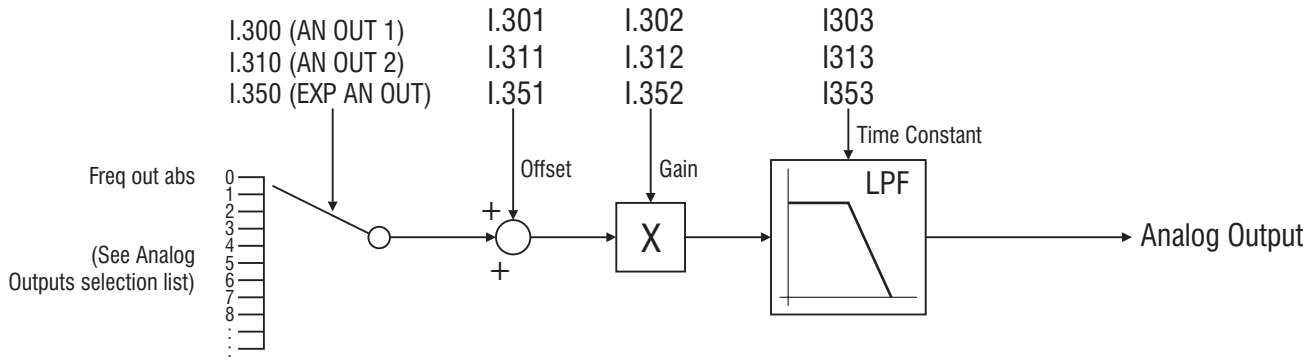


Figure 7.4.5: Analog Outputs

The adjustment card provides as a standard 2 analog outputs.
Resolution of analog outputs: 10 bits
A typical connection is indicated in the figure 5.5.1.

Both the analog outputs provide a unipolar signal with end of scale 0V / +10Vdc (if programmed as values "absolute" or "positive") or bipolar +/-10Vdc (if programmed as "generic signaling "), according to the parameter assigned.

I.300 – Analog Output Configuration (Configuration of the analog output)

Configuration of the function associated to the analog output, according to the following table:

0	Speed in output (absolute value)
1	Speed in output (bipolar)
2	Current in output (absolute value)
3	Current in output (bipolar)
4	Position
5	Speed reference (absolute value)
6	Speed reference (bipolar)
7	Current reference (absolute value)
8	Current reference (bipolar)
9	Voltage DCLink

I.301 – Analog Output Offset (Offset of the analog output)

Offset of the analog output.

I.302 – Analog Output Gain (Gain of the analog output)

Gain of the analog output.

I.303 – Analog Output Time Constant (Constant of Time of the analog output)

Constant of time of the analog output.

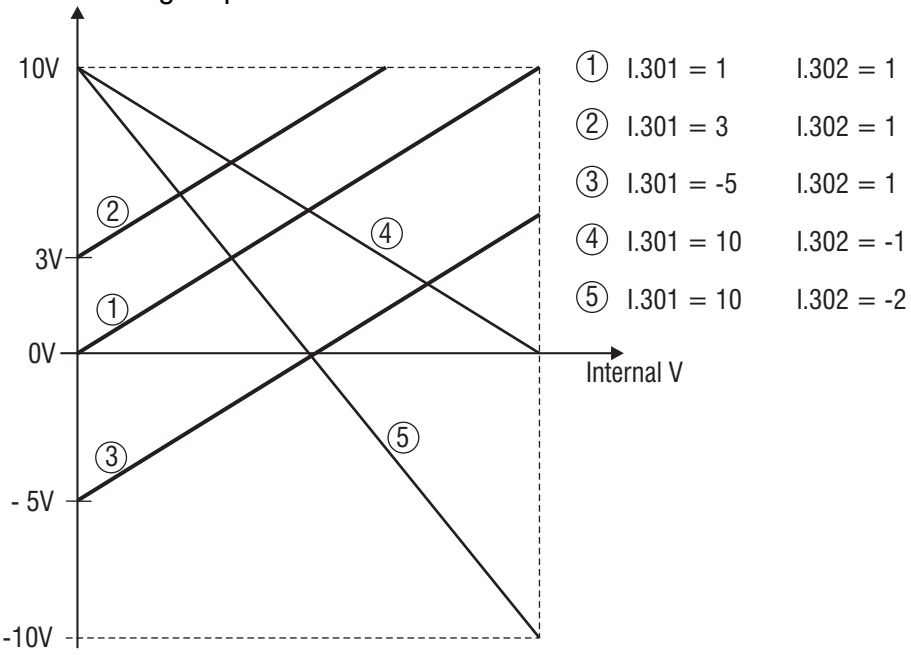


Figure 7.4.6: Scaling of references and minimum values

Encoder Configuration

I.500 – Freq. Reference Channel Conf. (Conf. Of Channels of the Reference of Frequency)

Configuration of the channel of reference of frequency (port encoder 1).

0 Encoder by two channels in squaring (ChA/ChB)

1 Encoder by single channel and signal of direction (Freq/Dir)

I.501 – Freq. Reference PPR (Impulses/Revolution of Reference of Frequency)

Impulses/revolution of the channel of reference in frequency (port encoder 1).

Configuration of the Encoder repetition

I.520 – Encoder Repetition Enable & Config (Enabling and Config. Encoder Repetition)

Configuration of the channel of encoder repetition (port encoder 2).

0 Encoder repetition disabled

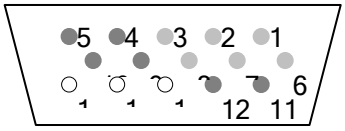
1 Encoder by two channels in squaring (ChA/ChB)

2 Encoder by single channel and signal of direction (Freq/Dir)

I.521 – Encoder Repetition PPR (Impulses/revolution Encoder repetition)

Impulses/revolution of the channel of encoder repetition (port encoder 2).

Scheme of use of encoder doors



Port 1 [pin 1,2,3,6,7,8 (clear grey)]

Port 2 [pin 4,5,9,10,11,12 (dark grey)]

To the port 1 can be connected the encoder of primary feedback or the channel of reference in frequency and acquisition of position. The two selections are mutually exclusive and use the following parameters:

Function	Config. Channels	Impulses/revolution
Primary Feedback	P.160	P.162
Acquisition and reference	I.500	I.501

Pay attention not to use both functions, remember that in case of conflict it is resolved in favor of the primary feedback.

To the port 2 can be connected the phases of commutation of the feedback encoder or can be used as port of encoder repetition. The two functions are mutually excusive but remember that the phases of commutation are used only during exact moments linked to the phasing of the rotor. The selection 30 (*Port 2 Encoder used for the phasing with phases of commutation*) of the analog outputs signals these moments, concentrated in the first moments of motor startup and during self-phasing (command C.100).

Encoder Power Supply

I.540 – Encoder Supply Selection (Selection of Encoder Power Supply)

Selection of the encoder power supply (present on the pin 14 of the connector DB15).

I.540 = 0 Power supply at 5V

I.540 = 1 Power supply at 24V

8.3. Menu r - REFERENCES

The drawing below described the logics for the "Selection of the References".

Scheme of the logics of selection of the references. The name of the parameters refers to the speed reference but the scheme is valid also for the references of current, the name of the parameters I.xxx related to the current reference is obtained by adding 400 (while the current reference is displayed by d.004) .

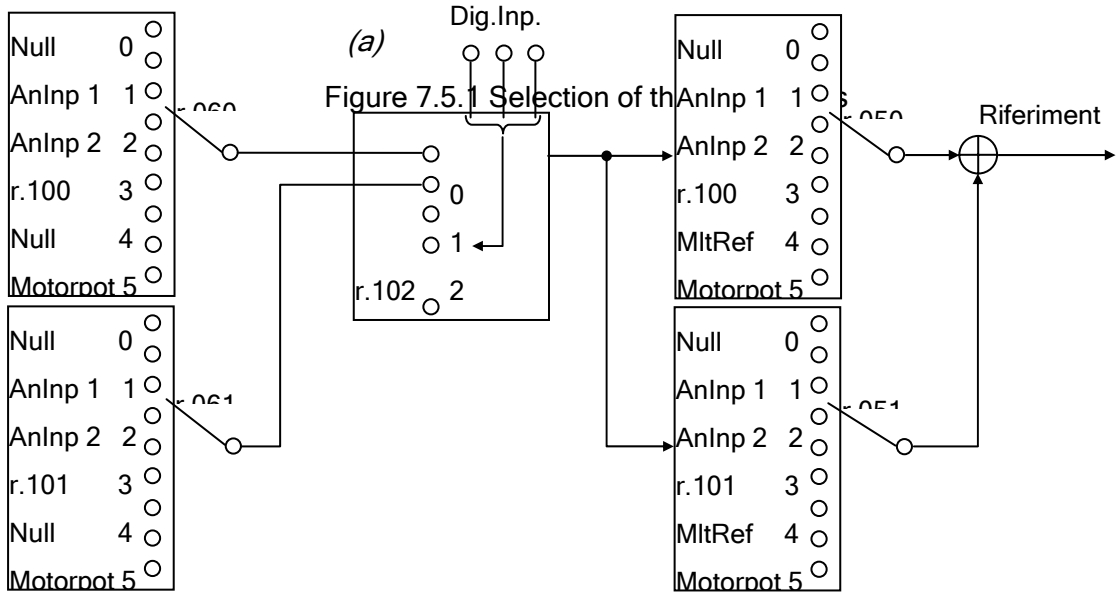


Figure 7.5.1 Selection of th

Motorpotentiometer

r.000 – Motorpotentiometer Reference (Reference of Motorpotentiometer)

Displaying this the keys UP and DOWN are activated in order to increase or decrease the value of the output speed of the Drive.

The maximum value settable is linked to the parameter Max Ref Spd (r.020).

To perform the START of the motor it is necessary to provide a command of RUN.

The reference from Motorpotentiometer, can also be modified through digital inputs, programmed as Motorpot up and Motorpot down.

It is possible to perform a reset of the reference set, through digital input programmed as Reset Motorpot.

r.010 – Motorpotentiometer Acc/Dec Time (Time Acc/Dec Motorpotentiometer)

Setting of the times of ramp (in seconds), with use of the function Motorpotentiometer.

The times of delay set here, shall be equivalent either for the acceleration than for the deceleration.

r.011 – Motorpotentiometer Offset (Offset of Motorpotentiometer)

Applying the command of RUN, the motor shall reach automatically such speed (offset) with the time of ramp set. The command Motorpot up, shall act thus from such value.

It also represents the minimum speed reachable with command Motorpot down.

r.012 – Motorpotentiometer Output Mode (Motorpotentiometer Polarity)

Definition of the polarity of the reference of the Motorpotentiometer (positive and/or negative).

In both settings the command hardware of REVERSE shall be activated (if enabled).

r.013 – Motorpotentiometer Auto Save (Motorpotentiometer Stored)

The enabling of this function allows the storage of the reference of Motorpotentiometer in the non volatile memory of the Drive. Upon the start the step of initial reference shall be the same saved in memory.

The disabling of this function allows the reset of the reference of the Motorpotentiometer upon each on/off cycle of the power supply voltage of the Drive. In this case, the storage of the parameters of the Drive through the parameter C.000 (or S.901) does not allow the storage of the Motorpotentiometer reference.

Speed references

r.020 – Maximum Speed Reference (Maximum of the Speed reference)

It identified the threshold for the digital or analog references and the maximum speed for both revolution senses.

This parameter considers the sum of the various references available in the Drive (Channel 1 and Channel 2).

r.050 – Speed Reference Channel 1 **(Channel 1 of the Speed reference)**

r.051 – Speed Reference Channel 2 **(Channel 2 of the Speed reference)**

These parameters allow to select the "source" from which the Channel 1 and the Channel 2 of the speed reference, are supplied and controlled.

The values of the 2 references shall always be in algebraic sum if they are used both.

r.060 – Multi Speed Reference Channel 1 **(Channel 1 of the Multi Speed reference)**

r.061 – Multi Speed Reference Channel 2 **(Channel 2 of the Multi Speed reference)**

These parameters allow to select the "source" from which the Channel 1 and the Channel 2 of the speed reference, of the function **Multispeed function** , are supplied and controlled.

r.100 – Digital Speed Reference 0 **(Digital Reference of Speed 0)**

r.101 – Digital Speed Reference 1 **(Digital Reference of Speed 1)**

r.102 – Digital Speed Reference 2 **(Digital Reference of Speed 2)**

r.103 – Digital Speed Reference 3 **(Digital Reference of Speed 3)**

r.104 – Digital Speed Reference 4 **(Digital Reference of Speed 4)**

r.105 – Digital Speed Reference 5 **(Digital Reference of Speed 5)**

r.106 – Digital Speed Reference 6 **(Digital Reference of Speed 6)**

r.107 – Digital Speed Reference 7 **(Digital Reference of Speed 7)**

It is possible to select up to 8 speeds of operation, whose value is set in these parameters.

The selection of these speeds can be performed through the binary codification of 3 digital inputs.

The maximum of the output speed is limited by the parameter Max Ref Spd (r.020).

The table indicated below, describes the basic sequences of the binary selection, for a complete configuration of the function Multispeed.

Speed Sel. 1	Speed Sel. 2	Speed Sel. 3	Active Speed Ref.
0	0	0	r.100
1	0	0	r.101
0	1	0	r.102
1	1	0	r.103
0	0	1	r.104
1	0	1	r.105
0	1	1	r.106
1	1	1	r.107

r.108 – Jogging Speed **(Speed of Jog)**

This is the speed reference associated to the command of jogging, i.e. selection of digital inputs 7 or command H.506(CW) and H.507(CCW).

Configuration of Ramps

r.200 – Acceleration Clock Wise **(Clockwise Acceleration)**
r.201 – Deceleration CW **(Clockwise Deceleration)**
r.202 – Acceleration Counter Clock Wise **(Anticlockwise Acceleration)**
r.203 – Deceleration CCW **(Anticlockwise Deceleration)**
r.204 – Acceleration CW 2 (Clockwise Acceleration)
r.205 – Deceleration CW 2 (Clockwise Deceleration)
r.206 – Acceleration CCW 2 (Anticlockwise acceleration)
r.207 – Deceleration CCW 2 (Anticlockwise deceleration)

The values of ramp are expressed in seconds and are meant as the time necessary to pass from speed 0 to r.020 (or vice versa).

r.250 – Ramp S-Shape (Curve of Ramp by S)

r.260 – Ramp Extension Source (Ramp Extension Source)

Motorpotentiometer of Current

r.400 – Motorpotentiometer Reference **(Motorpotentiometer Reference)**

See r.000.

r.410 – Motorpotentiometer Acc/Dec Time **(Time Acc/Dec Motorpotentiometer)**
r.411 – Motorpotentiometer Offset **(Offset Motorpotentiometer)**
r.412 – Motorpotentiometer Output Mode **(Polarity Motorpotentiometer)**
r.413 – Motorpotentiometer Auto Save **(Motorpotentiometer Stored)**

See r.010 – r.013.

References of Current

r.420 – Maximum Current Reference **(Maximum of the Current reference)**

It identifies the threshold for the digital or analog references and the maximum Current for both revolution senses.

This parameter considers the sum of the various references available in the Drive (Channel 1 and Channel 2).

r.421 – Minimum Current Reference (Minimum of the Current reference)

It identifies the minimum threshold of the value of current, under which it has no effect any adjustment, performed both with analog and digital references.

The START of the motor shall be performed (with the time of ramp set) at such current, also with null values of reference.

Such function is correlated also to the parameter Min output Curr (P.102).

r.450 – Current Reference Channel 1 (Channel 1 of the Current reference)

r.451 – Current Reference Channel 2 (Channel 2 of the Current reference)

These parameters allow to select the "source" from which the Channel 1 and the Channel 2 of the current reference, are supplied and controlled.

The values of the 2 references shall always be an algebraic sum, if both of them are used.

r.460 – Multi Current Reference Channel 1 (Channel 1 of the Multi Current reference)

r.461 – Multi Current Reference Channel 2 (Channel 2 of the Multi Current reference)

These parameters allow to select the "source" from which the Channel 1 and the Channel 2 of the current reference, of the MultiCurrent function, are supplied and controlled.

r.500 – Digital Current Reference 0 (Digital Current Reference 0)

r.501 – Digital Current Reference 1 (Digital Current Reference 1)

r.502 – Digital Current Reference 2 (Digital Current Reference 2)

r.503 – Digital Current Reference 3 (Digital Current Reference 3)

r.504 – Digital Current Reference 4 (Digital Current Reference 4)

r.505 – Digital Current Reference 5 (Digital Current Reference 5)

r.506 – Digital Current Reference 6 (Digital Current Reference 6)

r.507 – Digital Current Reference 7 (Digital Current Reference 7)

See r.100 – r.107.

8.4. Menu P - PARAMETER

Commands

P.000 – Command Source Selector (Selection of Source Commands)

The selections available are the following:

Sel.	Function	Notes
0	Keypad	START and STOP activated by the buttons on the keypad
1	Terminals	START and STOP activated through terminal board
2	Virtual	Main commands and I/O through virtual channels and/or terminal board
3	Serial	START and STOP and main commando through serial line (menu H)
4	Control Word	Main commands and I/O through bit of the word ProfiDrive

P.001 – Reversal Enabling (Enabling Anticlockwise run)

If set to zero, any negative reference shall be interpreted as null reference.

P.002 – Safe Start (Safe Start)

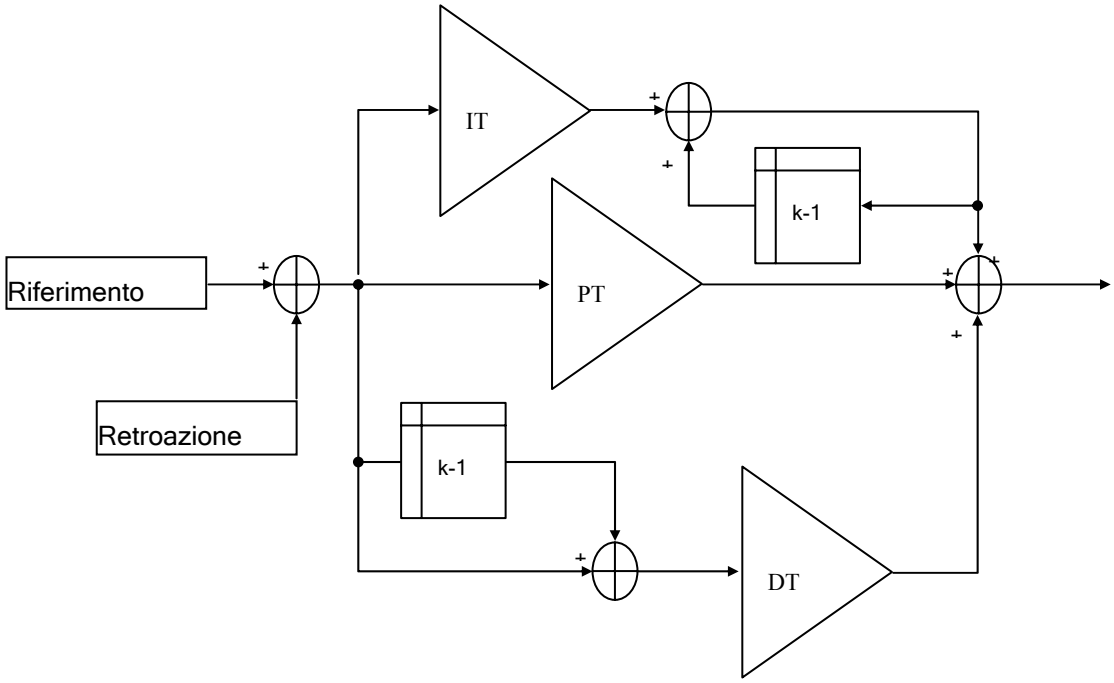
The parameter defines the behavior of the command of RUN (or REVERSE), upon the start of the inverter:

P.003 = 0 Command of RUN activated on the Level of a signal.
Upon the ignition of the Drive, the start of the motor is allowed with the command of RUN already existing in the terminal board.

P.003 = 1 Command of RUN activated on the Front of a signal.
Upon the ignition of the Drive, the start of the motor is not allowed if the command of RUN is already existing in the terminal board. The start of the motor may be performed by canceling and restoring the command of RUN.

Speed Loop

Scheme of the PID regulator of speed.



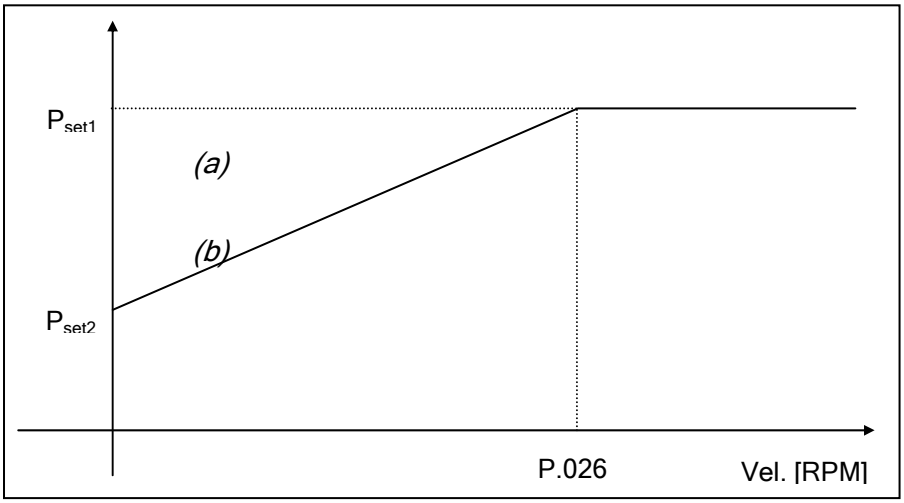
P.020 – Speed Loop Proportional Term 1 **(Speed Loop Proportional Term 1)**
P.021 – Speed Loop Integral Term 1 **(Speed Loop Integral Term 1)**
P.022 – Speed Loop Derivative Term 1 **(Speed Loop Derivative Term 1)**
P.023 – Speed Loop Proportional Term 2 **(Speed Loop Proportional Term 2)**
P.024 – Speed Loop Integral Term 2 **(Speed Loop Integral Term 2)**
P.025 – Speed Loop Derivative Term 2 **(Speed Loop Derivative Term 2)**

All values have null effect if placed at 0 and maximum effect if placed at 32767.

The change between the two sets can occur by configuring a digital input with selection 30 (*Selection set2 of the gains of the loop of speed*).

P.026 – Spd Loop Par. ChangeThreshold Spd **(Threshold of Parameters change in the Loop of Speed)**

Threshold of speed upon which it is complete the passage from the second set to the first set of parameters of the speed loop. When this parameter is different from zero, the motor starts with the set of parameters 2 and gradually passes to the set 1 with the increase of the speed, an example of the profile is given in the following image.



Power supply

P.040 – Nominal Main Voltage (Nominal voltage of Mains)

Nominal value of the voltage of mains [Vrms]. The function relative to the management of the alarm of "undervoltage", is based on the value set in such parameter. (see chapter PARAMETERS section: Configuration of Undervoltage).

P.041 – Nominal Main Frequency (Nominal Frequency of Mains)

Nominal value of the frequency of mains [Hz].

Motor Data

P.060 – Motor Rated Current (Nominal current of the Motor)

Nominal current [Arms] of the motor upon its nominal value of power (kW / Hp) and voltage (indicated on the data plate of the motor).

P.061 – Motor Peak Current (Current of Peak of the Motor)

Current of Peak [Arms] of the motor (indicated on the data plate of the motor).

P.062 – Motor Poles (Poles of the Motor)

Number of poles of the motor (indicated on the data plate of the motor).

P.063 – Motor Nominal Speed (Nominal speed Motor)

Nominal speed of the motor (indicated on the data plate of the motor).

P.065 – Motor Thermal Constant (Thermal constant of the Motor)

Thermal characteristic of the motor in use. The data is normally supplied by the manufacturer of the motor, and defined as the time necessary to reach the temperature of normal operation, in

conditions of operation at nominal current.

P.066 – Motor Stator Inductance (Inductance of the Motor)

Inductance of stator. [mH]

P.067 – Motor Stator Resistance (Resistance of the Motor)

Resistance of stator. [Ohm]

Limits of speed

P.080 – Maximum Output Speed CW (Maximum Clockwise Speed of output)

Maximum limit of the output speed, expressed as % of r.020.

P.081 – Maximum Output Speed CW Mode (Maximum Clockwise Speed of output)

Modality of limitation of the speed

0 Only through parameter P.080.

1 Through analog input 1 with end of scale equal to P.080.

2 Through analog input 2 with end of scale equal to P.080.

P.082 – Minimum Output Speed CW (Minimum Clockwise Speed of output)

Minimum limit of the output speed, expressed as % of r.020.

P.083 – Maximum Output Speed CCW (Maximum Anticlockwise Speed of output)

P.084 – Maximum Output Speed CCW Mode (Maximum modality of anticlockwise speed of output)

P.085 – Minimum Output Speed CCW (Minimum Anticlockwise Speed of output)

The same meaning of the three previous parameters but referred to the anticlockwise revolution.

Limits of current

P.100 – Maximum Output Current (Maximum Current of output)

P.101 – Maximum Output Current Mode (Modality of Maximum Current of output)

P.102 – Minimum Output Current (Minimum Current of output)

See P.080 – P.082.

Loop of current

The scheme of the regulator PI of current is similar to the one of the regulator PID of speed, of

course it must be eliminated the branch relative to the derivative term (DT)

P.120 – Current Loop Proportional Term (Current Loop Proportional Term)

P.121 – Current Loop Integral Term (Current Loop Integral Term)

All values have null effect if placed at 0 and maximum effect if placed at 32767.

Primary feedback

P.160 – Primary Feedback Selection (Selection of Primary Feedback)

The possible selections are those indicated below:

Sel.	Feedback
0	Revolver
1	Incremental Encoder by two channels
2	Incremental Encoder with a channel and signal of direction
3	Incremental Encoder by two channels + phases of commutation (Hall)
4	Incremental Encoder with a channel and signal of direction + phases of commutation (Hall)

P.161 – Rotor Position Offset (Offset of the Position of the Rotor)

Reserved.

P.162 – Feedback Encoder PPR (Impulses/revolution Encoder of Feedback)

Number of impulses/revolution of the encoder connected to the feedback.

Overspeed

P.180 – Antifugue Control (Control of Antifugue)

Placed at 1 it enables the signaling of error and the interruption of the run, if the output speed exceeds the value set in P.181.

P.181 – Overspeed Level (Level of Overspeed)

Level for the activation of the alarm of Overspeed, expressed in RPM.

Motor Overload

P.220 – Motor OL Protection Enable (Enable Protection for Motor Overload)

Placed at 1 it enables the monitoring of the thermal image of the motor and the related signaling of

error.

Configuration of braking resistance

P.240 – Braking Resistor OL Protection Enable (It enables the Prot. Overload Braking Res.)

Placed at 1 it enables the monitoring of the thermal image of the resistance of braking and the related signaling of error.

P.241 – Braking Resistor Ohmic Value (Braking Resistor Ohmic Value)

P.242 – Braking Resistor Power (Braking Resistor Power)

P.243 – Braking Resistor Thermal Constant (Braking Resistor Thermal Constant)

Management of Undervoltage

P.260 – Undervoltage Threshold (Threshold of Undervoltage)

Threshold of detection of the alarm of "undervoltage" (UV).

The threshold of undervoltage can be set at values include between the minimum value admitted and the nominal one of operation, referred to each of the voltages of power supply.

To this purpose, see the table below.

Power supply	Minimum Threshold UV	Nominal DC Bus
110	110	148
220	125	298
230	125	310
240	125	325

P.261 – Max Powerloss Time (Maximum time in Undervoltage)

Waiting time to reset the voltage of mains.

The lack of power supply for a time greater than the one set shall cause the stop of the Drive for alarm of “undervoltage” (UV).

P.262 – Undervoltage Alarm Save Enable (It enables the Recording of the Alarm for Undervoltage)

Through such parameter it is possible to define, if during the count of the time of Max Powerloss Time, the alarm must be equally stored in the “alarms list” or not (see DISPLAY, section Alarms list).

The alarm of “undervoltage” shall be displayed on the display with the message “UV”.

The signaling of the alarm of “undervoltage” when occurred in the conditions mentioned above, is available on digital output programmed as “UV running” (programming code 8).

Configuration of Autoreset

P.280 – Autoreset Attempts Number (Autoreset Attempts Number)

Setting the number of restart attempts, after the detection of the alarm.

P.281 – Autoreset Attempts Clear Enable (It enables to Clear the Autoreset Attempts)

When enabled, it sets to zero the counter of the events set, in the parameter Autoreset attempts (P.280), if no alarm is detected within a delay of 10 minutes.

P.282 – Autoreset Delay (Delay of Autoreset attempts)

Setting of the delay that passes between the detection of the alarm and the start of the sequence of autoreset.

P.283 – Alarm Status During Autoreset (Status of the Alarm During Autoreset)

Definition of the status of the alarm relay and of the digital outputs during the function of autoreset:

P.383	Drive OK	Alarm status	No alarm status
0	ON	OFF	ON
1	OFF	ON	OFF

Remark that the normal command of “Reset”, can be supplied also through digital input (see chapter INTERFACE, section Digital inputs). The command of reset shall be performed only if the Drive is in conditions of block (command RUN disabled) and the cause of the alarm eliminated.

Configuration of External Malfunction

P.300 – External Fault Mode (Modality of External Error)

Modality of detection of the command of External Error:

0 Detection always activated, autoreset not possible

1 Detection activated only with motor running, autoreset not possible

2 Detection always activated, autoreset possible

3 Detection activated only with motor running, autoreset possible

Configuration of phase loss

P.310 – Phase Loss Detection Enable (It enables the Detection for Phase loss)

Enabling this function it is detected an eventual lack of the single phases of the mains of power supply.

.

Speed thresholds

P.340 – Speed Threshold 1 **(Threshold of speed 1)**

Set point for the detection of the first threshold of speed.

The signaling of the detection of the threshold of speed, can be programmed on digital output.

P.341 – Speed Threshold 1 Hysteresis **(hysteresys on the Threshold of Speed 1)**

Definition of the tolerance inside the Speed Threshold 1 (P.340).

P.342 – Speed Threshold 2 **(Threshold of speed 2)**

P.343 – Speed Threshold 2 Hysteresis **(Hysteresis on the Threshold of Speed 2)**

See P.340 - P.341.

Signaling Speed on normal run

The function allows the signaling of an eventual variation of speed during the operation by constant speed.

P.360 – Constant Speed Tolerance **(Constant Speed Tolerance)**

P.361 – Constant Speed Signaling Delay **(Constant Speed Signaling Delay)**

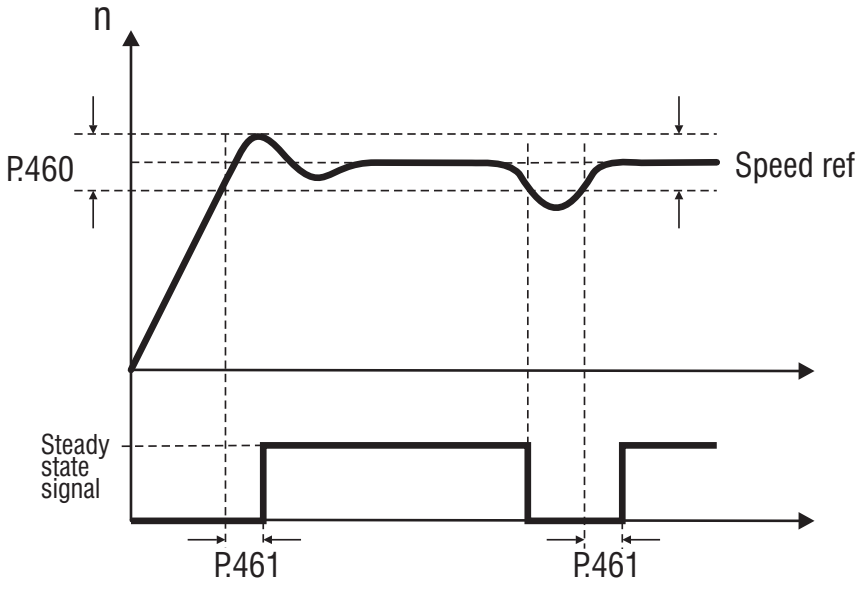


Figure 7.6.17: Signaling of speed variation

The signaling of the status of “constant speed” is available on digital output programmed as “Steady status” (programming code 6).

Threshold of Heatsink Overtemperature

Control and display of the Heatsink temperature of the Drive.

P.380 – Heatsink Temperature Alarm Level (Heatsink Temperature Alarm Level)

Not implemented.

P.381 – HS Temperature Alarm Hysteresis (Hysteresis of the Alarm Level in the Heatsink Temp.)

Not implemented.

Display Setting

P.420 – Display IPA at Start-Up (Parameter Displayed Upon the ignition)

The parameter whose IPA (see table of parameters list) is introduced in this parameter, is displayed as first at the start of the Drive.

Protection parameters

P.999 – Parameters Protection Code (Parameters Protection Code)

Options of protection from the writing of the parameters.

0 Protection excluded

1 Protection activated with the exclusion of the parameters r.100-107, r.500-507

2 Total protection activated

3 Protection excluded and storage of possible running (NOT SUGGESTED)

8.5. Menu A – APPLICATION

GENERAL CONFIGURATION

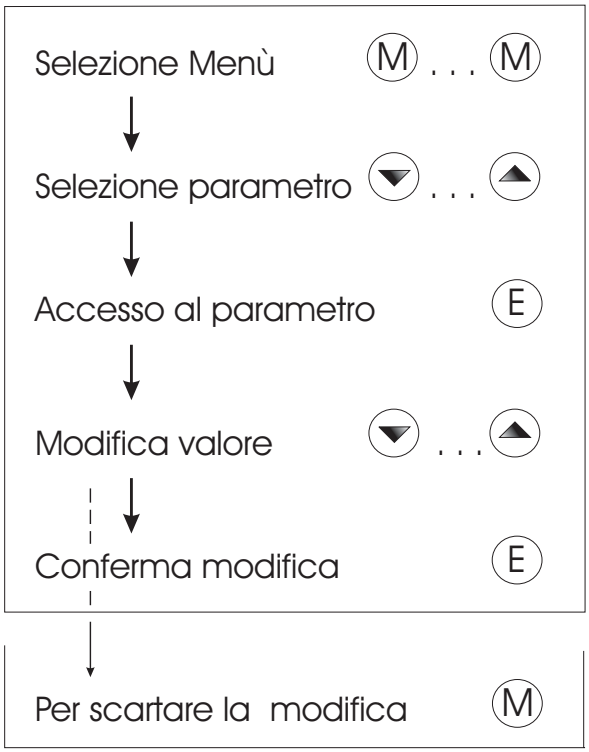
A.000 – Operation mode (Operation mode)

Available Modalities:

Sel.	Modality	Note
0	None	No modality selected
1	Speed	Control of the motor in speed – activated the speed references
2	Current	Control of the motor in current (couple) – activated the references of current
3	Positioner	Not available
4	Electric axis	Not available

8.6. Menu C - COMMAND

All the parameters of the menu COMMAND required for their performance the procedures described below [it is the same to act on the numeric parameters] :



The parameters Commands upon the access are in 'off' and with the key UP they are brought to 'do', now with the key 'E' it is performed the function and on the display appears the message 'done'. The Command has been performed_

Basic

C.000 Save parameters (Storage of parameters)

Any modification made to the parameters is immediately accepted and performed by the Drive.

The storage of such modifications shall be made in a permanent way, only by applying such command.

If such operation is not performed, all the modifications made shall be lost when the Drive is not power supplied anymore.

C.001 Recall param (Recall parameters)

Such function recalls the parameters previously stored, replacing them with those temporarily in use.

C.002 Load Default (Loading industry parameters)

Loading the industry parameters.

Their storage is chosen by the user and must be performed in any case through the command C.000.

Reset of Alarms list

C.020 Alarm clear (Reset of alarms register)

Complete zeroing of the register of Alarm List (D.800…D.803).

Programming Key

C.040 Recall key prog (Recall the parameters from key)

Recall and storage of the parameters contained in the external key with memory KM-PRGE (optional)

The option must be introduced in the connector JP10, present on the adjustment card.

C.041 Save pars to key (Storage of parameters on key)

Recall and storage of the parameters container in the external key with memory KM-PRGE (optional)

The option must be entered in the connector C1, over the display

Self calibration

C.100 – Autotuning & Autophase (Calibration and Phasing)

It performs the self calibration and phasing of the transducer of position. See the suitable chapter.

9. Chapter Troubleshooting

9.1. Drive in a Condition of Alarm

The situations of alarm are signaled, with the code associated to the specific event, on the keypad and, physically on the digital output programmed to signal the status of alarm.

9.2. Reset of an Alarm

The operation of reset of an alarm can be performed through one of the three following possibilities:

Reset of an alarm through the keypad: it can be performed pressing simultaneously the keys Up and Down; the reset shall have effect when the pressure on the keys shall be released.
Reset allowed only with the Drive disabled.

Reset of an alarm through digital input: it can be performed through the programming of a digital input as "[5] Alarm reset"_
Reset allowed only with Drive disabled.

Reset of an alarm through the function Autoreset: it allows the automatic reset of some parameters of the Drive (see tables 9.3.1), through the correct setting of the parameters P.380, P.381, P.382 and P.383.
Reset allowed also with the Drive enabled.

9.3. List of the Alarm Messages of the Drive

The table 9.3.1 lists the messages of alarm displayed by the Drive.

EF	EXTERNAL FAULT	External alarm
OC	OVERCURRENT	Hardware, detected by the module IGBT
OV	OVERVOLTAGE	
UV	UNDERVOLTAGE	
OLi	OVER LOAD INVERTER	
OL	OVER LOAD MOTOR	
OLr	OVER LOAD BRAKE UNIT	
PH	PHASE LOSS	
TO	SERIAL TIMEOUT	
OC-	OVERCURRENT	Software, current over the threshold
Bf	BUS FAULT	
OH	OVERTEMPERATURE	Disabled by the power
OHr	OVERTEMPERATURE REGULATION	Overtemperature of the adjustment card
DSP	DSP INTERRUPT LOSS	
RL	RESOLVER LOSS	
EL	ENCODER LOSS	
HP L	HALL PHASES LOSS	
AO	ANALOG OFFSET	
OS	OVERSPEED	
PE	PARAMETERS ERROR	
PEbF	PHASING ERROR BAD FEEDBACK,	
PEMd	PHASING ERROR MOT DONT MOVE,	
PEME	PHASING ERROR MOT MOVE WRONG	
PEMP	PHASING ERROR MOT PHASE	
PEbP	PHASING ERROR BAD ENCODER PPR	
PECU	PHASING ERROR CHANNELS UNBALANCED	

REMARK! The thresholds of intervention of the sensor contact of the alarm OH and of the analog sensor of the alarm OHS, depend upon the size of the Drive (75 °C ... 85 °C).

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